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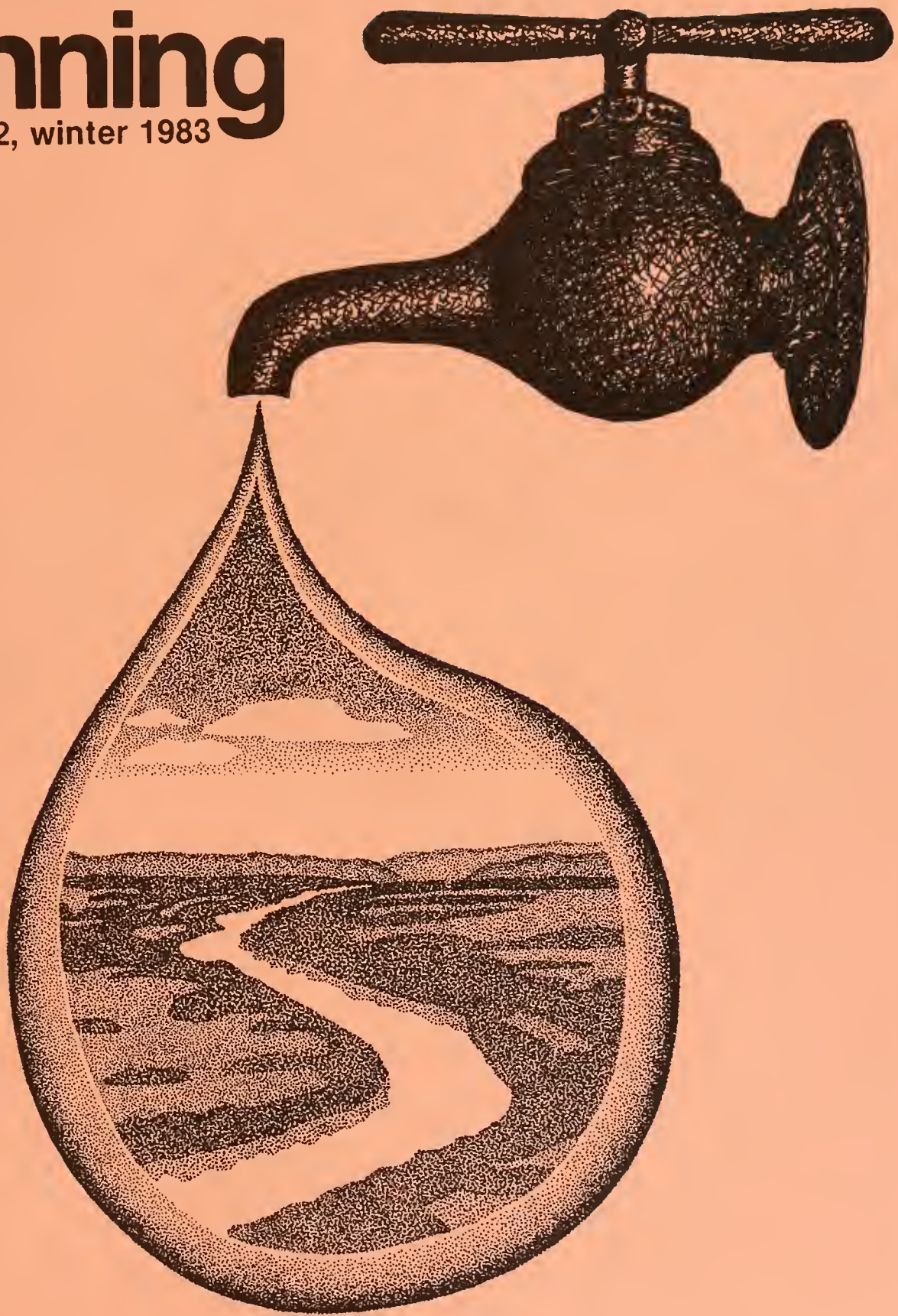

Introduction:
Special Issue on Water Resources Planning

Water resource problems are diverse and widespread. Headlines like "Leaking Tanks Threaten Groundwater", "Sedimentation Prompts Watershed Controls", and "Safe Transport of Toxics Urged" punctuate a growing citizen awareness. In addition to these quality concerns, population growth in the Southeast has resulted in water quantity demand increases -- not just for drinking water supply, but also for uses such as irrigation and cooling in electricity production. Lack of reservoir sites can limit water supply options, and the cost of delay in securing water of adequate quantity or quality can further constrain development. These issues are closely related to other concerns shared by planners. The range of articles presented in this special issue provides an understanding of the breadth of the planning interests (economic development, land use, energy, etc) that overlap with water issues.

Four authors provide a statewide overview of water resources policy and practice. James Kundell examines state strategies for managing water in the Southeast, Todd Miller advocates adoption of a more farsighted and selective growth recruitment and permitting strategy as a first step toward more effective water protection, and William Drummond and Kathleen Heady address North Carolina's role in financing local infrastructure.

Local watershed protection programs are described by two authors. Mary Joan Pugh outlines High Point's watershed performance zone and rating system, which is an innovative attempt to control stormwater runoff by regulating types and intensities of land use. The history of Salem Lake Watershed protection is described by Julie Shambaugh.

Expositions of a more technical nature are also included in this issue. Karen Allenstein lends a critical eye to the potential for groundwater use development in the Piedmont and Mountain regions of North Carolina. Jackie Dingfelder shares excerpts from articles dealing with overall energy consumption and its implications for water resource planning, and an evaluation of the potential for increased use of small scale hydroelectric power.

Sue Snaman's article deals with public management of private wastewater systems, specifically package treatment plants. Douglas Wrenn discusses issues common to urban waterfront redevelopment efforts, and Margaret Kerr's piece on the N.C. Streamwatch Program notes how citizens are encouraged to become actively involved in local water resource management and protection.

Editors' Note: The focus of the North Carolina Chapter of the American Planning Association annual conference will be water resources planning, and will be held April 26-27 in Chapel Hill.

Co-Editors: Jane Hegenbarth, Susan Jones

Advertising: Claudia Shambaugh

Staff: Karen Allenstein, Noreen Beiro, Jackie Dingfelder, Ted Harrison, Laura Hill, Kathleen Leyden, Sam McDonald, Dick Paik, Sue Snaman (with assistance on special projects from Becky Foster and Nancy Randall)

Graphics: Lee D. Einsweiler, Susan Jones
Front Cover: James A. Anders, Jr.

Editorial Advisory Board Members
Michael Stegman, David Godschalk, William Rohe, Harvey Goldstein, Scott Bollens, Noreen Beiro, Ken Robertson

In The Works contributed by Noreen Beiro, Mary Ellen Bowen, and Susan Jones.

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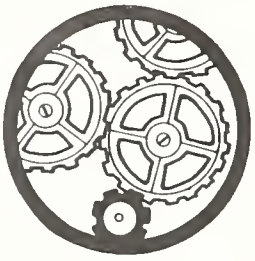


In The Works

GREENSBORO NEIGHBORHOOD SELF-HELP PROGRAM

"Helping Neighborhoods Help Themselves" is the motto of the Neighborhood Self-Help Program administered by the Greensboro Department of Planning and Community Development. The program, now in the third year of implementation, provides up to $5,000 annually to recognized neighborhood advisory committees in the city's community development target areas. The program's structure is designed to give neighborhood groups the opportunity and the skills associated with initiating, planning and administering projects that meet the identified needs of their neighborhoods.

Proposals for funding must originate from the neighborhood advisory committees. The organizations are responsible for establishing planning committees to identify community needs and develop appropriate solutions; demonstrating neighborhood support for the projects, including collection of petitions supporting the project from at least 10 percent of the households within the target area; and managing the completion of the planned activities. Eligible activities include neighborhood cleanup and beautification, vacant lot clearance, crime prevention programs, weatherization projects, and neighborhood education projects.

To date, six neighborhoods have undertaken nine projects involving a total of nearly $12,000 of Neighborhood Self-Help funds. The projects have funded a variety of activities, including sale and installation of smoke detectors, tree planting, and educational workshops.

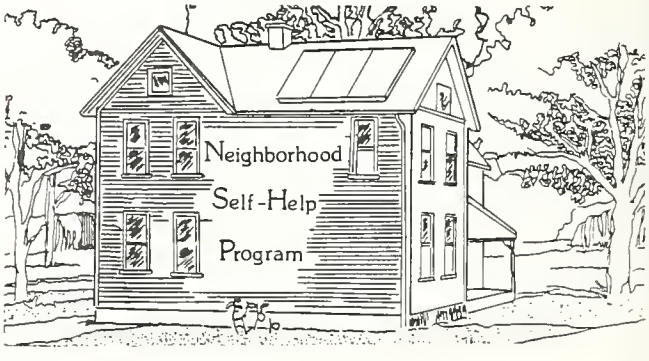
In response to a series of residential fires in the Asheboro area, neighborhood organizers sold 199 smoke detectors to area residents at a reduced cost. The Fire Department assisted with installation where needed and provided fire inspections in those homes. Since then, three other neighborhoods have sold smoke detectors, resulting in the installation of over 500 detectors.

Using Neighborhood Self-Help funds and advisory assistance from the city Parks and Recreation Department, residents in the Glenwood area planted and cared for 116 red maple trees. The Glenwood Neighborhood Advisory Committee also hosted a series of short courses in home improvements, landscaping, and money management. Co sponsored by the Guilford Technical Institute, the sessions were very successful and involved a total of 39 residents.

Proposed projects for future funding include a landscaping beautification program for the College Hill neighborhood. The plans call for the planting of rows of trees to produce a canopied effect along one of the streets in this historic area. Several other neighborhoods are preparing proposals for funding decisions.

The program is tentatively slated to end in June of 1984, but the city expects the program impacts to continue far beyond that time. In addition to the concrete improvements made in the neighborhood, the program has increased residents' perceptions of the identity of their neighborhoods and made them aware of the positive changes that can occur if residents work together. The experience of carrying out small neighborhood improvement projects has also enabled residents to gain skills in the areas of decision-making, problem solving and program planning. The results of this greater degree of neighborhood organization are demonstrated by the recent incorporation of several neighborhood organizations and the development of more sophisticated Community Development Block Grant proposals submitted to the city. The city also benefits from the improved relationship between itself and the neighborhood organizations.

For more information, contact: Gloria Nance Sims, Community Development Planner, Department of Planning and Community Development, City of Greensboro, Drawer W-2, Greensboro, N.C. 27402. (919)373-2144.



REVITALIZATION UNDERWAY IN DOWNTOWN HIGH POINT

Downtown High Point is currently the site of considerable development activity as a result of significant effort by local government, the High Point Economic Development Corporation (HPEDC), and numerous private investors. The opening of Radisson Hotel, the addition of 800,000 square feet of furniture showroom space, and the construction of a county governmental complex are just a few of the developments that promise to bring more dollars, people and activity to High Point's once-ailing downtown.

Three of these development activities -- the new Radisson Hotel, the redevelopment of a former furniture factory into Market Square, and the planned improvements to Commerce Avenue -- illustrate the potential for successful downtown revitalization when public and private interests work together. A common objective of all three projects is to upgrade and diversify downtown High Point by making it the center for year-round activity, not just the host of the semi-annual Southern Furniture Market. These developments are also designed to enable High Point to capture a larger share of North Carolina's convention and business meeting market.

The Grand Opening of the $20 million 249-room Radisson Hotel in early November was the result of several years of planning by the city, HPEDC, and the hotel developer. HPEDC initiated the hotel project, commissioned the market feasibility study and helped arrange financing for the public and private portions of the project. The city obtained a $1.7 million Urban Development Action Grant which was used as a second mortgage and provided a combination of general obligation bond revenues and excess electricity utility revenues to construct an adjacent parking deck.

The $10 million remodelling and transformation of the Tomlinson Furniture Manufacturing Company building into Market Square was undertaken by a group of local businessmen. The 500,000 square foot structure is unique because it includes a number of the nation's premier design furniture showrooms open for trading year round, North Carolina's third largest trade show center, a restaurant, and a private club. Banquet and catering facilities capable of providing for 1,500 diners are also being planned. Although Market Square is a privately financed and developed project, HPEDC played an important role by providing technical market data.

HPEDC has also worked to ensure the success of Market Square and other downtown developments by planning and administering the Commerce Avenue beautification project which links Market Square, the Radisson and other downtown attractions. These improvements will be financed primarily through the city's Community Development Block Grant program, with a small amount of funding obtained from the city's excess electricity revenues.

Other significant developments, either completed or underway, in downtown High Point include the construction of a $10 million 300,000 square foot design center by the Southern Furniture Market, several private office buildings, and the adaptive reuse of the Holt McPherson Center, a formerly abandoned building which now serves as home for a number of community art and service organizations.

For more information, contact: David T. Peet, President, High Point Economic Development Corporation, P.O. Box 1730, High Point, N.C. 27261. (919)886-5179.

INTERDISCIPLINARY WATER RESOURCES GROUP FORMS

In the spring and summer of 1983, a group of people in the Research Triangle area met to discuss the possible formation of a multi-disciplinary group to address water resources issues. The result was the formation of the North Carolina section of the American Water Resources Association (AWRA), the 27th section to form in the United States since the organization's beginnings in 1964.

The North Carolina AWRA chapter held a well-attended public symposium in Raleigh on "Phosphorous and Falls Lake" in September, and the topic of its January meeting was groundwater and hazardous wastes. Location of the quarterly meetings will move around the state.

AWRA was organized nationally as a scientific and educational nonprofit organization to foster interdisciplinary communication among persons of diverse backgrounds working on any aspect of water resources. The principle objectives are:

- the advancement of water resources research, planning, development, management, and education

- the establishment of a common meeting ground for engineers, and physical, biological, and social scientists concerned with water resources

- the collection, organization, and dissemination of ideas and information in the field of water resources science and technology

North Carolina AWRA's 60 current members represent citizens; local, state and federal governments; planners; regional agencies; industry; and academia. Persons throughout the state with an interest in any area of water resources are encouraged to join.

For more information, contact David Meacham, Secretary-Treasurer, c/o Duke Power, P.O. Box 33189, Charlotte, NC 28242. (704)373-5989.

NEW TECHNIQUES IN COMMERCIAL RECRUITMENT FOR SMALL CITIES

Nearly every downtown has faced the development of a regional shopping mall within the last ten years. With this development usually comes the move of the downtown anchor retail stores -- and the threatened demise of the traditional shopping core. Many small cities are caught off-guard, empty-handed, and with a quickly deteriorating and outdated downtown.

But in Sanford, North Carolina, a group of far-sighted people decided to do something about their downtown when talk about a regional shopping center was in the early stages. They realized the importance and potential of their downtown, and contacted the Community Development offices of the State Department of Natural Resources and Community Development (NRCD). With NRCD help and a study completed by a planning firm from Charlotte, the Sanford downtown business people developed a seven-block municipal tax district to initiate funding for a downtown revitalization project. City and county funds were also solicited for the project. In July 1983, three years after the district had been developed, a project director was hired and downtown revitalization began in Sanford.

One of the most challenging programs of the project is an effort toward recruiting commercial business for the downtown area. The Chamber of Commerce, in conjunction with the Downtown Revitalization Project, has developed a Commercial Recruitment Team whose objective is to fill the gaps of vacant retail space and balance retail mix in the downtwon area. This team consists of local specialists in marketing, city regulations, available sites, utilities, livability, and finance. When a client has been contacted and invited to Sanford, the team is responsible for researching and gathering all information necessary for satisfying the individual client's needs before the visit occurs.

For example, if a large department store was entertained as a potential client, the team members would be expected to have prepared information on all downtown sites having the square footage that the store would require, utility costs of each site, number of accessible parking spaces, shipping and loading space, and applicable city regulations. A financial "package" would be prepared including information concerning low-interest commercial loans, special incentives, and tax credit and investment information if the building is in a historic district.

The Commercial Recruitment Team is patterned after the successful Industrial Recruitment Team of the Sanford-Lee County Chamber of Commerce, the only difference being that the state is usually responsible for the initial client contact. In commercial recruitment, however, the recruiting is the responsibility of the local community or county. The initial contact of clientele is one of the greatest challenges in the area of commercial recruitment. While new business recruitment is a common need in small cities all over the United States, there is no general procedure by which to proceed. A few of the small cities in North Carolina have formally organized commercial recruitment programs, and Sanford's unique recruitment "team" approach is one of the newest. A commercial recruitment network is in the planning stages at the state level to aid small cities in organization and effective action plans to move commercial businesses into the downtown area once again.

Our endeavors are still young, so we are looking for people with whom to share ideas and experiences. If you are working with, or thinking of starting a similar project, let's communicate. Contact Mary Ellen Bowen, Project Director, Sanford Downtown Revitalization Project, Box 1523, Sanford, NC 27330. (919) 774-6153.

Managing Water Resources
Lessons from Florida and Georgia

Water management is by and large a state responsibility. How a state has met this responsibility depends on a variety of factors such as the availability of water, demands placed on the water resource, types of water problems, state bureaucratic structure, and the political environment in which decisions are made. Each state has thus developed its own mechanisms for managing water resources. At the same time, however, common stimuli such as federal water quality mandates, federal funding for water projects, and new insights obtained from research have resulted in states addressing similar problems in similar ways.

Prior to the 1970's, only limited action had been taken by the southeastern states toward managing their water resources. Most of these actions related only to flood control, municipal water supply, primary wastewater treatment, and other basic public health functions. The reason for this dearth of water activities relates to the abundance of water and limited demands on the resource.

Federal Involvement

With the passage of the Federal Water Pollution Control Act of 1972, all southeastern states were placed under common water quality mandates. This law made it a national goal to reach "fishable and swimmable" water quality standards by 1983. To do this it provided funds to establish the National Pollution Discharge Elimination System (NPDES) to regulate municipal and industrial point waste discharges, construct

WATER MANAGEMENT IS BY AND LARGE A STATE RESPONSIBILITY

wastewater treatment facilities, classify streams, monitor water quality conditions, regulate dredge and fill operations, and determine the nature and extent of nonpoint sources of pollution. Authority to implement this law was assigned to the United States Environmental Protection Agency (EPA), which in turn could delegate implementation authority to states with demonstrated ability to fulfill the mandates of the law. All southeastern states have received partial or full implementation authority from EPA, with the exception of Section 404 permits which deal with dredge and fill, no southeastern state has been delegated authority for these.

Water Allocation

Unlike water quality, water allocation is a state authority -- no federal mandate exists. As a result, states differ in the steps taken to divvy up the resource between competing water users. Although all of the southeastern states originally depended on the courts to settle disputes over water rights, most have taken legislative action to clear up ambiguities associated with the common law approach. As shown in Figure 1, the only two southeastern states that have not passed water allocation laws are Alabama and Tennessee.

Most southeastern states have applied the concept of capacity use area in their water management approach. Mississippi, North Carolina,

A CAPACITY USE AREA IS SIMPLY AN AREA IN WHICH THE DEMANDS ON THE WATER HAVE REACHED THE CAPACITY OF THE RESOURCE TO MEET THAT DEMAND

South Carolina, and Virginia all include this concept. Originally Georgia, which patterned its water allocation approach after North Carolina, required the creation of capacity use areas but in 1973 amended its law to remove this requirement.

A capacity use area is simply an area in which the demands on the water have reached the capacity of the resource to meet that demand. Once this occurs, the area is designated as a capacity use area and a moratorium is placed on new water uses. The basic problem with this approach is that it is reactive. The state takes no action until all the decisions which could be made to optimize the use of the water resources have been rendered unusable. David J. Howells, in the summary report of The Southeast Conference on Ground Water Management (Chapel Hill: Water Resources Research Institute, University of North Carolina, 1980) concluded that the capacity use area approach had not proved "notably successful." The reason states have had problems with this approach varies from the difficulty of creating a capacity use area, to vague agency directives on what to do once one is created, to the exemption of too many water users. This

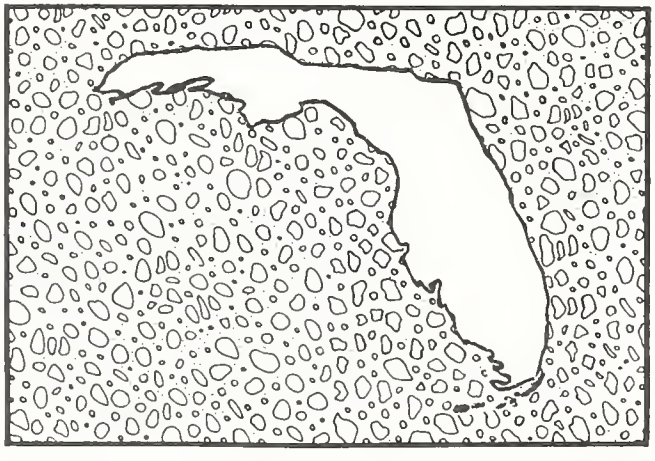
Dr. James E. Kundell is Science and Technology Associate in the University of Georgia Institute of Government.

does not mean that such an approach cannot work but there are some inherent problems with it.

Comprehensive Water Management in Florida

The two southeastern states which have developed similarly comprehensive water management programs are Florida and Georgia. Florida was a pioneer in southeastern water management when, in 1949, it created the predecessor to the South Florida Water Management District, primarily for flood control purposes. This regional approach has been maintained in Florida, with the state now divided into five water management districts. Although these districts are under the umbrella of the state Department of Environmental Regulation (DER), they are nearly autonomous. The major reason for this independence lies in its taxing authority. Districts have the authority to levy ad valorem taxes and thus have greater flexibility in funding programs than the DER.

The two-tiered approach adopted by Florida was patterned after the Model Water Code (or possibly vice versa). As conceptualized, a state would have regional water management agencies whose operations were overseen and coordinated by the state regulatory agency. Although this is somewhat the case in Florida, it appears that the tail may be wagging the dog. The independent funding of the districts makes them powerful fiefdoms which are not dependent on state appropriations nor require state agency oversight.



The crux of the problem is evident in integrating water quality control with water quantity management. Water management districts are the primary allocation agency. They have the authority to permit water withdrawals. Water quality control authority, however, has largely been withheld from the water management districts. In an attempt to coordinate quality and quantity efforts, regional offices of DER are now co-housed, wherever possible, with the water management districts. Although this may resolve some problems, both DER and the districts make water quantity and water quality decisions without requiring coordination and communication between the two.

The magnitude of this problem is exemplified by the fact that Florida is the only southeastern state which has not been delegated authority from EPA to run the NPDES program, the principal water quality program in the state. According to James E. Kundell and Vicki A. Bremen in Regional and Statewide Water Management - Alternatives (Athens: Institute of Government, University of Georgia, 1982), although the state legislature has grappled with this problem for several years, it is yet to be resolved.

This does not mean, however, that Florida does not have an effective water management program. It must by neccessity. Florida is confronted with the greatest pressure on its water resources while having the most vulnerable water resources of any southeastern state. It is faced with too much and too little water simultaneously. Threats to water quality from agrichemicals and industrial and municipal waste are insidious. This very complex situation requires a sophisticated bureaucracy to address the problems. Florida has developed a more detailed data base, water resources modeling capacity, and water resource decision-making capability than any other southeastern state. However, it still needs to address the organizational coordinating mechanisms which currently impede management efforts.

> ...FLORIDA IS THE ONLY SOUTHEASTERN STATE WHICH HAS NOT BEEN DELEGATED AUTHORITY FROM EPA TO RUN THE NPDES PROGRAM...

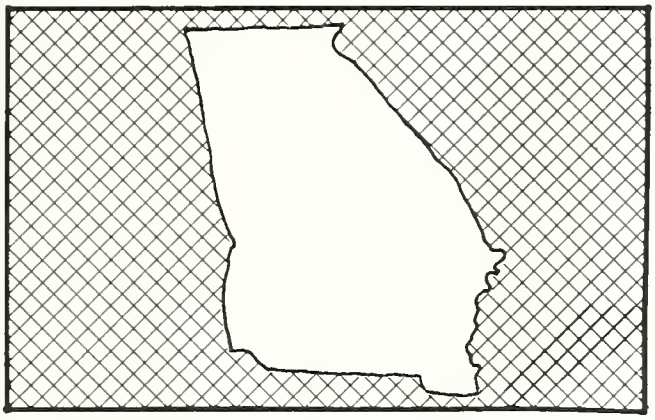
Integrated Water Management in Georgia

Georgia's water management approach differs from that of Florida's in three major ways:

1. Georgia has instituted a statewide rather than a regional water management program. As previously mentioned, the capacity use area requirement originally in Georgia's allocation law was removed in 1973. This led to the statewide approach in which the Environmental Protection Division (EPD) of the Georgia Department of Natural Resources issues permits throughout the state for withdrawals of both surface and groundwater in excess of 100,000 gallons per day.

2. Georgia has a centralized rather than dispersed water management organization. Whereas Florida conducts most of its business on the regional level through the regional offices of DER and the water man-

agement districts, Georgia's EPD conducts most of its major activities in the central state office. Regional offices are primarily used for inspection and monitoring purposes while the state office carries out most of the other responsibilities such as issuing NPDES and water withdrawal permits.



3. Whereas Florida has separate agencies responsible for water quality (state DER, federal EPA), and water allocation (water management districts), Georgia's EPD has been assigned all water quantity and water quality authority possible under state and federal laws. As a result, the integration of water quality and water quantity with surface and groundwater decisions rests with the single state agency.

The southeastern states are ideally suited to water management. The comparatively abundant water of the humid southeast enables greater flexibility to water management agencies in reaching water supply and water quality goals. Major impediments relate to the legal and organizational barriers that negate coordination and integration of decisions. This occurs in the organizational structure of Florida and the legal foundation of most other southeastern states. If a state has not provided the water

MAJOR IMPEDIMENTS RELATE TO THE LEGAL AND ORGANIZATIONAL BARRIERS THAT NEGATE COORDINATION AND INTEGRATION OF DECISIONS

agency with allocation authority or has limited this authority to a capacity use area in which the resources are already overextended, few management alternatives are available. Water quality decisions primarily related to the issuance of NPDES permits for industrial and municipal waste discharges are made throughout the state, yet in the southeast are usually not.

Since water quality is generally a function of water quantity (the amount of water available to assimilate waste), the lack of authority to address water withdrawals limits the agencys ability to reach its water quality standards. According to Hatcher and Kundell in Institutional Arrangements for Integrated Water Management in the Southeast (Athens: Institute for Natural Resources, University of Georgia, 1983), by providing a single state agency (EPD) with the legal authority to issue surface and groundwater withdrawal permits plus the NPDES waste discharge permits, the Georgia General Assembly has not created any legal or organizational barriers to integrating the water quality control functions with the water quantity management activities.

Of course, implementing an integrated water management program is more difficult than developing one. Georgia did not consciously begin implementing its integrated water management program until 1980. At that time, EPD created the Water Resources Management Branch and assigned it the responsibility of developing the water management strategy. Efforts have focused on improving the water resources data base, instituting data management procedures, and developing regional river basin appraisals. The idea is to manage water on a river basin basis enabling local priorities and resource characteristics to guide EPD's water management activities. Only one river basin appraisal, for the Coosa River in northwest Georgia, has been completed thus far.

Although Georgia has been able to avoid organizational problems evident in Florida, Florida has developed a tighter water management program. A key difference between the programs relates to agricultural water use. In Florida, agricultural water users come under the same requirements as other major water users. In Georgia, however, agriculture is exempted from the water management program. This preferential treatment is not unusual for rural southeastern states such as South Carolina and Mississippi which, like Georgia, are faced with increasing

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"...implementing an integrated water management program is more difficult than developing one."

Julie Shambaugh

Salem Lake Watershed

A Community Asset and Responsibility

At the April 1983 meeting of the Winston-Salem Board of Aldermen, Board members urged the City Manager to develop guidelines for protecting the Salem Lake watershed, a source of 40 percent of the city-county drinking water supply. Board members stressed the importance of protecting this valuable community asset. The Salem Lake watershed is located in the northeastern part of Forsythe County. The watershed is approximately 16,000 acres, or 25 square miles, and is relatively small compared to the areas of Jordan or Falls of the Neuse watersheds. Salem Lake's watershed is situated in three governmental jurisdictions: the town of Kernersville, the city of Winston-Salem, and the county of Forsythe, which have zoning control over 37, 41, and 32 percent of the area, respectively.

History of Water Supply Sources in the Watershed

Use of Salem Creek as a water supply source first began in 1877 when the creek became the main source of water for the town of Salem. The privately-operated Salem Water Supply Company made its first purchases of land and water rights in the watershed in 1902, and in 1907 the water company was purchased by the town of Salem.

As the town grew, Salem Creek was relied upon to an even greater extent to provide drinking water for the community. The town of Salem operated the water works until the 1913 consolidation of Salem and Winston. In 1919 a dam was constructed on Salem Creek by the City of Winston-Salem to create Salem Lake. As water demand increased, the dam was raised five feet in 1921, three feet in 1931, and three feet in 1947 as a consequence of the 1946 drought.

In 1947 it was clear that Salem Lake would not be able to supply the increasing water needs of Winston-Salem past 1956. Consideration of alternate water supply sources resulted in the combined use of Salem Lake and the Yadkin River. Salem Lake presently provides an annual average of nine to ten million gallons per day (mgd), which supplies approximately 40 percent of the drinking water, with the remaining 60 percent coming from the Yadkin River. This combination of water supply sources is believed to be adequate for the city and county needs well into the 21st century.

Salem Lake has always been considered a valuable community water resource. Over the years, the City has acquired property around the 365-acre lake. The City presently owns approximately 900 acres of land which is used as a park for low-intensity recreational activities -- fishing, hiking, and limited boating. The city-owned land around the lake acts as a protective buffer from the more intensive land uses. Because of its topographic setting with respect to the remainder of Winston-Salem, water from Salem Lake can flow by gravity to the main water plant, eliminating operational costs of pumping and electricity. Winston-Salem operates both the park and the water works; and the city has a firm commitment to the long-term use of the lake as a continued source of public drinking water supply and as a recreational facility.

SEDIMENTATION IS A MAJOR SOURCE OF POLLUTION IN THE LAKE AS A RESULT OF CONSTRUCTION AND AGRICULTURAL ACTIVITIES

Sources of Watershed Pollutants

When the town of Salem first began using Salem Creek as a drinking water supply source in 1877, the creek's watershed was mostly wooded. At that time, the water was impacted little by point and nonpoint sources of pollution, fertilizers and phosphorus. Presently, 87 percent of the watershed is zoned residential, although most of the land is in agricultural or woodland uses. Single-family residential development is an ever-increasing use of the land within the watershed. Interstate 40 cuts through the southern part of the watershed and crosses over the lake. More intensive industrial and commercial land uses are concentrated around interstate interchanges and in the Kernersville portion of the watershed.

Sedimentation is a major source of pollution in the lake as a result of construction and agricultural activities, and its primary impact on Salem Lake is a reduction in capacity of its storage volume. In 60 years, the reservoir has

Julie Shambaugh, formerly with the City-County Planning Board in Winston-Salem, is now Beach Access Program Coordinator with North Carolina's Office of Coastal Management.

lost 24 percent of its total capacity. This is not considered to be a critical factor in the longevity of the reservoir given an overall reduction of sedimentation loads, and an expected low future rate of sediment deposition due to the slow rate of development in the watershed. Continued minimization of sedimentation from agriculture and construction activities remains important, however, to overall water quality.

Septic systems are another source of pollution. In 1968, new State Board of Health regulations required a 40,000 square foot minimum lot size for single family development using septic systems in water supply watersheds. In the expectation that 95 percent of the watershed would be sewered by 1979, an exemption to this minimum lot size was granted in the Salem Lake watershed, and 20,000 square foot lots now cover portions of the watershed where public sewer is not available. Only 40 percent of the watershed is presently sewered, and due to economic and geographic constraints, it is unlikely that the watershed will be sewered by the year 2000. Although incidences of septic system failure have been limited in the watershed, septic systems (typically with a design life of 20 to 30 years) are not permanent or fail-safe methods of sewage disposal or treatment.

Watershed Protection Concerns

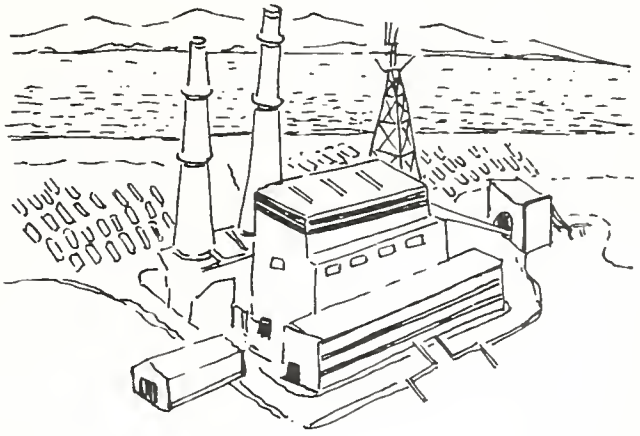
Protection of the watershed has become more important in recent years. Questions have been raised regarding the appropriate type, intensity, and location of development to be permitted in the watershed. Watershed protection measures need to be stricter. In response to the pollution of Kernersville's water supply reservoir and recent controversial zoning proposals in the Salem Lake watershed, local citizens groups and the various governing bodies having jurisdiction in the watershed have promoted watershed planning.

In June 1977 vandals released the contents of Destructo Chemway Corporation's chemical storage tanks into Kernersville Lake. Thirty-eight thousand gallons of chemical waste poured into the lake, the city's main source of drinking water. As a result, Kernersville had to tie into the city-county water supply system and has amended its zoning ordinance to prohibit the location of hazardous waste operations in the watershed.

In August 1982 the City-County Planning Board reviewed a 54 acre subdivision proposal located just west of Salem Lake. Three hundred and seventy-five angry residents from the area

signed a petition opposing the development and requesting that the city purchase the 14 acres of land in the proposed subdivision which drained directly into the lake. In the fall of 1982, the Winston-Salem Board of Aldermen agreed to purchase the 14 acres of land in hopes of protecting the lake as a source of drinking water.

In February 1983 the City-County Planning Board approved a petition to rezone 4.7 acres of land adjacent to Salem Lake from residential to industrial. In May this case was heard by the Winston-Salem Board of Aldermen, who because of their deep concern for the protection of Salem Lake watershed, remanded the case back to the Planning Board for site plan approval. The case has been continued indefinitely.



A Watershed Protection Program for Salem Lake Watershed

The April 1983 request by the Winston-Salem Board of Aldermen to develop guidelines for watershed protection was a result of growing community concern about a valued water resource. The City-County Planning Board staff has drawn up a watershed protection program for the Salem Lake watershed. Elements of the program include:

1. A request to the State Board of Health to revoke the exemption granted in 1969 for single-family lot size in the watershed
2. Creation of a Salem Lake watershed overlay district within which site plan review would be required
3. Development of a county-wide policy for the location and installation of package treatment plants requiring State permits
4. Preparation of a more detailed, long-range development plan for the watershed

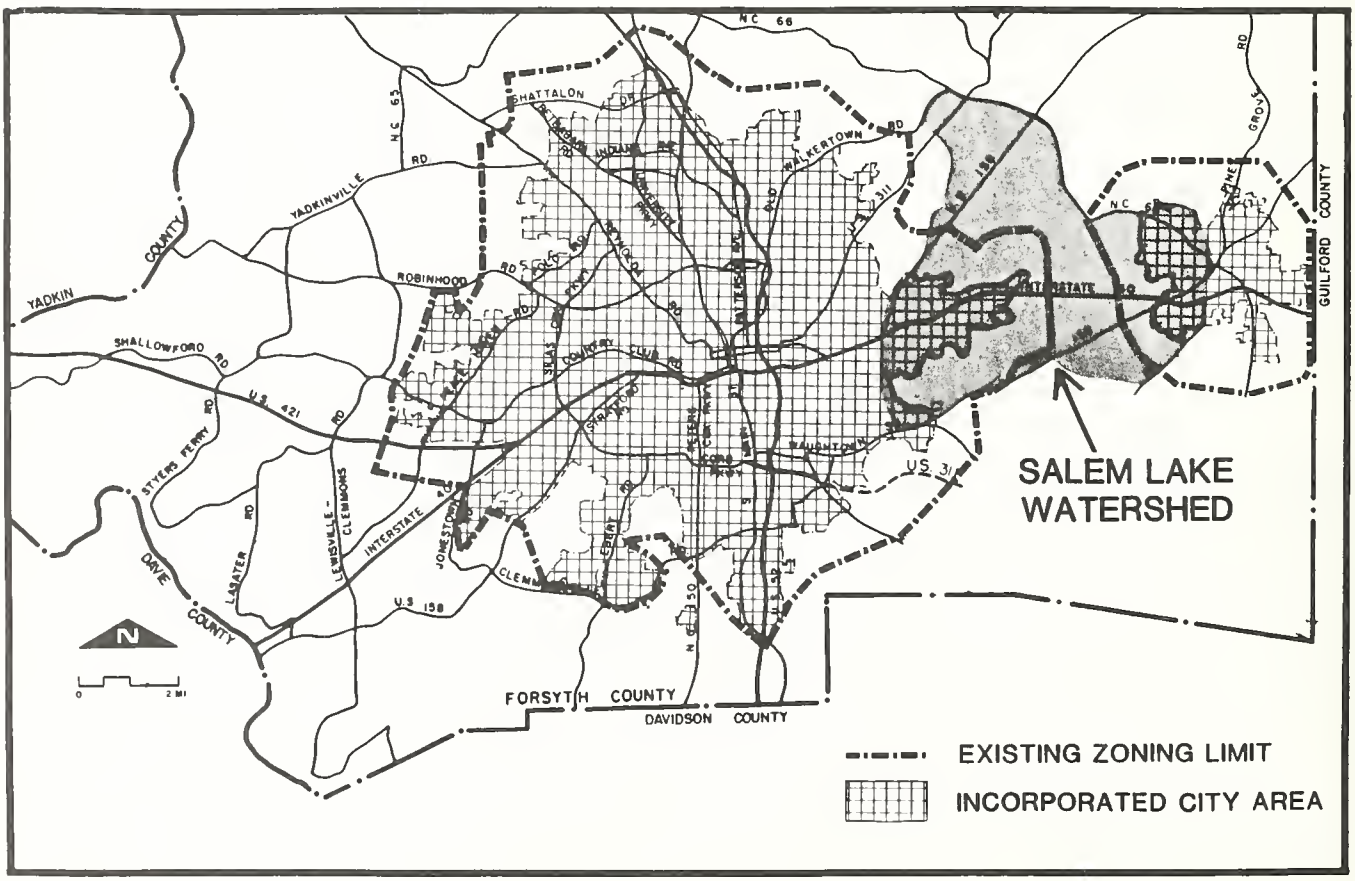
In implementing the three primary elements of the watershed protection program, it is hoped that the three overseeing governmental jurisdictions will each adopt similar requirements and regulations.

In order to achieve the first element of the watershed protection plan, which is to revoke the 1969 lot size exemption, the State Board of Health must receive evidence that there is city and county support for the change. Recently, a proposal requesting a resolution from the city and county managers to reinstate the 40,000 square foot minimum lot size requirement for single-family development on septic systems was approved by the City-County Planning Board, the Winston-Salem Board of Aldermen, the City/County Utility Commission, the Forsythe County Board of Commissioners, and the Kernersville Board of Aldermen.

Now, the state must formally revoke the exemption before the larger lot size will go into effect. Existing 20,000 square foot lots would be grandfathered just as they were in 1968. By reinstating the regulation, single-family development would be in compliance with the intent and content of the 1968 Board of Health regulation. Overall residential density in the watershed would be reduced in order to decrease the risk of septic system failure and nonpoint sources of pollution, and an additional septic system field could be identified on each lot to insure proper septic system functioning should the original system fail.

The second item under consideration is proposed amendments to city and county zoning ordinances adding watershed protection regulations. The proposed amendments were presented at a public hearing before the City-County Planning Board in September 1983. The Board voted unanimously in favor of recommending the ordinance be adopted by the Winston-Salem Board of Aldermen and the Forsyth County Board of Commissioners. It has been requested that the Kernersville Board of Aldermen also consider the adoption of a similar ordinance.

The proposed ordinance creates a Salem Lake watershed overlay district within which land use and development standards are regulated. Within the district, it would be unlawful to proceed



with development or issue building, zoning, or grading permits without required site plan approval. The following two uses, however, would not require site plan approval:

1. Development of a single-family lot in a subdivision with a current preliminary approval, or having final approval granted prior to the adoption of this ordinance
2. Construction of an individual single family dwelling, two family dwelling, or placement of a mobile home on an individual lot

The ordinance would restrict certain land uses in the watershed district. These would include primarily heavy manufacturing and industrial uses, as well as landfills and hazardous material use, storage or disposal. The ordinance would require other land uses such as less intensive manufacturing, restaurants, schools and laboratories to be on the gravity sewer systems within the watershed. A final group of land uses would require a state-licensed engineer to prepare an environmental assessment of any adverse consequences of the proposed use, and to prepare engineering designs showing the mitigation of any such expected consequences. Land uses in this category include less intensive manufacturing, freight terminals, service stations, and storage yards.

PRIVATELY-OPERATED PACKAGE TREATMENT PLANTS ARE AN ISSUE OF GROWING CONCERN

Site plans required in the watershed district would require additional information beyond that already requested on site plans outside of the watershed district. This information includes soils and stream buffer area identification (100 year floodplain). The application of design standards which minimize environmental consequences of development on watershed water quality would also be required.

For approval of the site plans, the following factors would be considered:

- management of stormwater generated by proposed post development design
- control of erosion during and after construction
- fitting the proposed development and minimizing grading
- protection and maintenance of natural drainage ways, stream buffers, and existing vegetation
- minimizing the amount of impervious surface area
- evaluation of the effect of the proposed development upon the water quality of the watershed district
- overall compliance with site plan standards

The third item in the watershed protection program is a recent, but significant, addition. The location of privately-operated package sewage treatment plants in the county, either on the Yadkin River north of the water intake facility or within the Salem Lake watershed has become an issue of growing importance. City and County officials have proposed that a set of guidelines for approving private treatment plants be prepared. Such standards are likely to be stronger than the existing state standards which regulate the amount of sewage a plant may discharge but do not address the cumulative impacts of multiple plant discharges on long-term water quality. Development of a county-wide policy for the location and installation of package treatment plants is likely to meet little state opposition.

The fourth and final task of the program is to prepare a long-range development plan and a set of development guidelines for the watershed. Such a plan would consider the natural features and processes of the watershed; the types of existing land uses; pollutant sources and their impacts on receiving waters; as well as existing ordinances, regulations, programs, and policies affecting the watershed. After analysis of such factors, a land use pattern of appropriate future land uses would be proposed along with land treatment strategies and design guidelines for mitigating watershed water quality problems. The plan would also address such items as: location of major transportation corridors; non-point sources of pollution; rural/agricultural preservation; open space protection; sedimentation and erosion control; stormwater runoff management; type, location and intensity of future development; sewer extension policies; and agricultural pollution. The preparation of such a plan will require the expertise of numerous individuals within the county and its implementation will require continued public support.

Growing Water Demand
A Concern for Piedmont and Mountain Regions

Many regions in North Carolina have experienced tremendous increases in population growth and industrial development in the past decade. As shown in Figure 1, latest projections by the Bureau of Economic Development point to a continuation of this growth pattern, with the Piedmont and Mountain regions of the state being no exception to this trend (from Heath, Ralph C., Better Utilization of Ground Water in the Piedmont and Mountain Regions of the Southeast, 1978). Census records show that the populations of the Piedmont and Mountain regions are increasing at a rate of a little over one percent per year with an anticipated doubling of the population by the year 2020. One of the many implications of this dramatic growth pattern is the apparent depletion of municipalities' current water supplies. As seen in Figure 2, most public water supplies in the regions are from surface water sources; specifically, streams, lakes and reservoirs. To keep pace with demand, new surface water sources will have to be developed on a large scale. Conservative estimates for the region as a whole indicate a three-fold increase in all water uses over the next forty years. Obviously, this necessitates extensive development of additional sources.

Difficulties arise with continued pursuit of a surface water impoundment strategy in the Piedmont and Mountain regions of North Carolina.

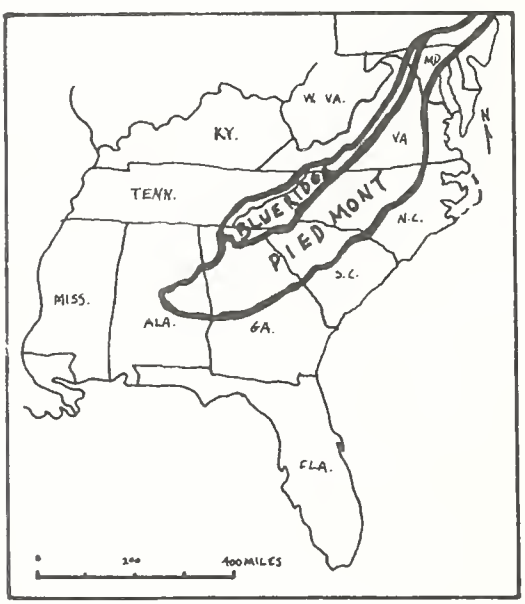


Figure 1. The Piedmont and Mountain regions.

The major problems cited in recent groundwater studies in the state include: 1)reservoir development competes with farming, housing and industrial development for a limited land resource, 2)many of the best reservoir sites are already in use, 3) less suitable sites would probably require more land area and be more prone to contamination, and 4) construction of reservoirs is costly. As a consequence of these significant drawbacks of surface water development, state and local officials are now critically examining alternative sources of water. One suggestion is to assess the potential of existing groundwater supplies and develop these to supplement surface water supplies. The remainder of this report examines the overall viability of adopting such a strategy to help meet future water demands in the Piedmont and Mountain regions of North Carolina.

Some Characteristics of Groundwater

In general, groundwater has many attractive features as a source of supply. Groundwater has a relatively low cost of development since it is stored naturally, thereby eliminating the cost of impoundment facilities. These costs are further reduced because the supply frequently is available at the point of demand, so the cost of transmission is reduced significantly. Groundwater is also considered cleaner than surface water supplies since it is filtered by the natural geologic strata. This would result in savings due to reduced treatment. Another important characteristic of groundwater is its ability to sustain moderate yields during the annual drought periods commonly occurring in North Carolina. Finally, use of groundwater generally permits other land use activities provided there is no contamination or paving of the crucial recharge area.

In spite of these anticipated benefits, groundwater remains an underutilized water supply source in the Piedmont and Mountain regions. Data from a recent survey show that only about 13 percent of the 132 public water supplies serving communities of at least 500 individuals in the region rely on groundwater (Figure 2). Use of water by public water supplies amounted

Karen Allenstein is a Master's candidate in the Department of City and Regional Planning at the University of North Carolina-Chapel Hill.

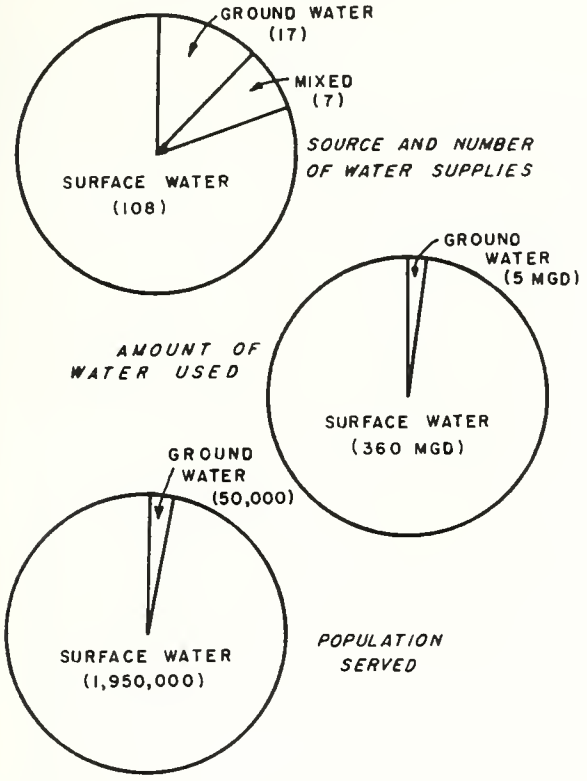


Figure 2. Relative importance of surface and groundwater sources for public water supplies in the Piedmont and Mountain regions of North Carolina.

to about 365 million gallons per day (mgd) in 1975. Of this total, only about 5 mgd (1.4 percent) was groundwater. The population served by public water supplies was about two million, and of these only 50,000 (about three percent) used groundwater. Clearly, groundwater is a source yet to be tapped.

Groundwater Availability

It is not clear why the region's ground water supplies have not been developed. Studies conducted by the North Carolina Department of Natural Resources and Community Development (NRCD) indicate not only that the water supply exists but that it is available in many places for pumping. The NRCD findings show that areas of the Piedmont similar to the Upper Cape Fear River Basin suggests that the groundwater system may possibly support large yields. For example, many wells in the Georgia Piedmont produce more than 100 gallons per minute (gpm) and some yield nearly 500 gpm. Similarly, studies conducted in 1972 indicated yields from 100 to 300 gpm for bedrock wells in the Piedmont and Blue Ridge regions from Maine to Virginia (N.R.C.D. Cape Fear River Basin Study: 1981-1983).

In considering groundwater availability, site-specific values for storage and recharge based on the prevailing bedrock lithology should be used. Groundwater is stored in the regolith and in the underlying fractured bedrock (Figure 3). The regolith averages about 50 feet in depth and contains approximately 1.5 billion gallons per square mile of potentially available water. Seasonally, this value ranges from 1.3 to 1.7 billion gallons per square mile. Storage capacity in the fractured bedrock is low and decreases to nearly zero below a depth of about 400 feet. Under natural conditions, precipitation represents 100 percent of the input to surface and groundwater supplies. Precipitation data from National Weather Service stations at Graham, Greensboro and High Point averaged 45.9 inches per year for the period from 1971 to 1980. About 19 percent of this amount infiltrates to the water table to recharge the groundwater system.

Capturing Groundwater

The ultimate success in developing large supplies of water from wells depends on selecting sites at which the bedrock contains the largest number of fractures and the thickest regolith structure. Geologists have long recognized the relation between bedrock fractures and land surface topography. Valleys develop where the bedrock is most highly fractured. Consequently, high yielding wells will be located in draws or narrow valleys that have a high water table. Often such sites encompass a stream, which, under conditions of maximum groundwater development, would serve as a source of recharge. This theory was supported in a study completed in 1983 by the NRCD. Three test wells were constructed for evaluating site selection criteria. The sites were located near Gibsonville, Greensboro and High Point. Selection of the particular sites was based on the topography and drainage patterns, as well as the height of the water table, the thickness of the regolith, and the degree of bedrock fracturing. It was concluded that all of these features were significant in determining the best well location. Of the three test wells, two produced above-average yields. (The third well was abandoned after it reached a metamorphosed basaltic dike that was not expected to yield much water.)

CLEARLY GROUNDWATER IS A
SOURCE YET TO BE TAPPED

The important point revealed by the NRCD study is that if large supplies of groundwater are to be developed in the Piedmont and Mountain regions, well locations must be selected with the same care presently employed in determining an appropriate dam site for a surface water supply. Too often in the past, municipal supply wells have been drilled on land which cities al-

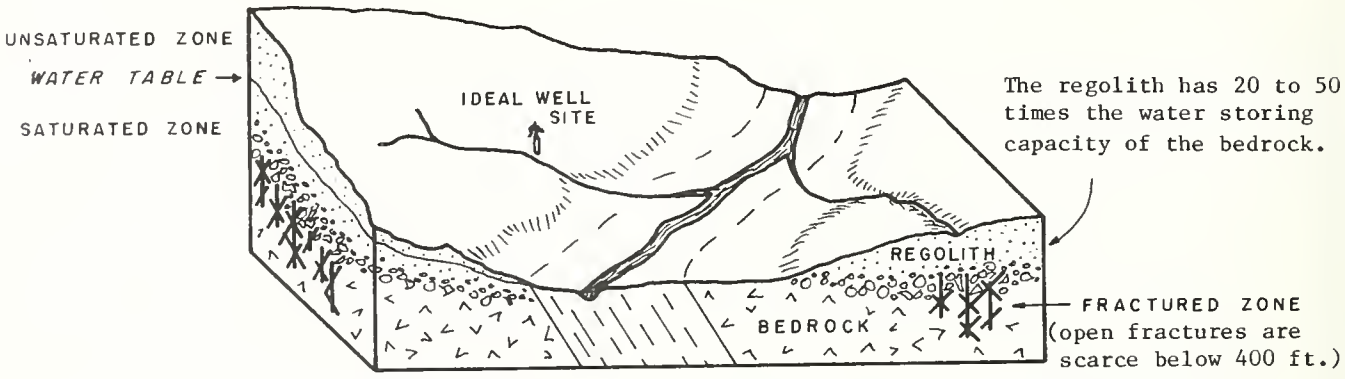

UNSATURATED ZONE
WATER TABLE
SATURATED ZONE
IDEAL WELL SITE
REGOLITH
BEDROCK
The regolith has 20 to 50 times the water storing capacity of the bedrock.
FRACTURED ZONE (open fractures are scarce below 400 ft.)

Figure 3. Generalized drainage pattern and associated landforms, along with principal components of the groundwater system typical of northwestern Guilford County, indicating the ideal well site (modified from Heath, 1978).

ready owned or that could be readily obtained. According to Heath (1978), in many cases this land did not contain ideal well sites, and efforts to develop groundwater supplies were unsuccessful.

Steps in Well Site Selection

Due to the complexity of the groundwater system in the Piedmont and Mountain regions, sound hydrogeologic criteria are of utmost importance in selecting sites for wells. The NRCD suggests the following steps to maximize yields: 1) determine possible correlations between the highest yielding wells and various geologic and geomorphic features, 2) determine the location of zones or areas of abundant fractures which will transmit water, and 3) determine local areas of thick regolith affording the greatest potential for groundwater storage.

An explanation of an ideal well site is summarized in Figure 3. Its features include lines of wells in the valleys of perennial streams, wells drilled at sites where the topography indicated cross fractures, and consideration of the characteristic bedrock.

Conclusion

With prudent planning and pumping schedules designed to account for the seasonal variation in recharge rates, significant quantities of water can be obtained from the groundwater resources in the Piedmont and Mountain regions of North Carolina. By withdrawing the groundwater which would otherwise be discharged to streams, and tapping the water in drainable storage for short periods; municipalities will have a pure, dependable water source to help meet their future demands.

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Urban Waterfronts
Awash with Controversy

The effective reuse of waterfront sites, buildings, and piers, both for economic development and recreational and cultural activities, is occurring in several cities. Baltimore, Boston, Seattle, and other cities are discovering new uses for their abandoned or deteriorating waterfronts, and in the process attracting people and revenue to the revitalized harbors.

Successful redevelopment varies widely, but there are several development issues that are common to all waterfront projects: handling regulations and permits, deciding on the appropriate use of the waterfront, providing public access, and ensuring citizen participation.

Regulations and Permits

One of the most controversial aspects of waterfront development is the regulatory requirements imposed on waterfront lands. As a result, waterfront development is subject to a multitude of governmental regulations and permit requirements. To the private developer, the jurisdictional structures guiding the development process is difficult and counterproductive. The range of development opportunities is limited by restrictions pertaining to use, density, design, and access. Also, the review and approval process is time consuming and laborious. The result is an elongated if not indefinite development time frame that is stretched to the point of undermining the project's feasibility.

The impact of the regulatory process is manifested in several ways. Regulations add to development costs and thus the risk of the project. The developer responds to the risk by either abandoning the project or changing certain aspects of the project such as focusing on a higher income market or increasing the intensity of development. When regulations are oppressively complex and stringent, developers are overly cautious. This undercurrent of concern stifles creativity, and projects are predictably bland.

The developer has a vested interest in the immediate and long-term success of a project and given the chance would only develop an economically sensible project without serious environmental degradation. Thus, his argument is that many regulations are not necessary and the process is unresponsive to waterfront development efforts.

On the other hand, many lawmakers, regulators and citizens embrace a different viewpoint. From their perspective, regulations are more complex and abundant for waterfront lands because shorelines are limited, fragile resources of tremendous public value. It is in the public interest to control and manage this resource. The permitting process serves as a mechanism to coordinate the disjointed and incremental decisions affecting urban waterfronts and as a means of safeguarding against the pursuit of immediate financial rewards at the expense of long-term environmental or community degradation. This view holds that if a development proposal is truly meritorious it will sail through the regulatory process without a scratch.

Baltimore's Inner Harbor redevelopment program combines water-dependent and conventional uses.

Government agencies on all levels have a clear public interest responsibility to protect waterfront resources. This purpose must be satisfied, however, in a way that does not penalize the development industry. Just as it is in the public interest to manage shorelines for future productivity and enjoyment, it is also in the public interest for cities to realize economic development opportunities.

Douglas Wrenn is an Associate in the Urban Land Institute's Publications Division, and is author of ULI's recent publication, Urban Waterfront Development.

Review periods need to be shortened and redundancies that are a result of jurisdictional overlaps removed. One effective remedy available to city governments is to assign one staff member to a waterfront development proposal for the expressed purpose of guiding it through the permitting and approval process. In Tacoma, Washington, for example, the city appointed a waterfront development manager to ensure that the City Waterway project was successfully implemented. Improvements could also be made if all regulations were written in a clear, concise manner. Furthermore, whenever possible, performance standards should be used instead of design standards.

While regulatory changes are certainly in order, private developers must also take steps to improve existing circumstances. Developers should acknowledge that waterfronts are unique urban resources that require special treatment. They should take advantage of information sources and study the jurisdictional policies and regulations pertaining to shoreline development. The wheels of the regulatory process should also be lubricated with cooperation and good faith.

Deciding on Appropriate Use

The appropriate use of waterfront land is an issue that commonly paralyzes the redevelopment of urban shorelines. The controversy centers on deciding among water-dependent uses, water-related uses, and uses that are not dependent on or have any relationship to the water.

The argument made in support of a very restrictive policy is that given a finite amount of waterfront land, it is in the public interest to reserve it for uses that need a shoreline site to exist. Uses such as cargo shipping terminals, ferry and passenger terminals, marine construction and repair facilities, marinas and moorage facilities, and tug and barge companies should not have to compete with residential, retail and office uses for waterfront sites since competition from these uses can drive up land values to the point of making water-dependent uses obsolete. Therefore, these uses should be given preferential treatment in order to capitalize on the full potential of the water resource and to safeguard its future as a site capable of supporting such water-dependent uses.

A less restrictive policy is to allow water related uses in addition to uses absolutely dependent on a shoreline location. Thus, single-user terminals, seafood plants, petroleum processing plants, waterfront parks, public resorts, aquariums, and restaurants are permitted uses. This approach offers more flexibility; it encourages traditional waterfront uses while allowing functional changes to occur. Conserva-

tionists feel that this policy provides for t[illegible] full use of waterfront lands and strengthens the functional attachment of the city to the water resource.

Most private developers do not see the need for excluding primary urban uses from city waterfronts. From their persective, the highest and best use of waterfront land should be determined by site characteristics and market forces. Developers point out that because of technological innovations many water-dependent uses are no longer economically viable in central city locations. Consequently, use restrictions perpetuate the underutilization and deterioratin of urban waterfronts. In support of this belief, developers point to cities such as Boston, Baltimore, and San Diego where the lack of restrictions did not produce exclusively non-water-related development. In some cases, office, retail, and residential uses generate enough revenue to cover the cost of developing secondary water-related uses that otherwise would not be feasible.

It is difficult to make blanket statements regarding the appropriate use of urban waterfronts because each city has a unique set of conditions and circumstances that must be taken into account. In general terms, a use is only appropriate if it reflects the special characteristics of a waterfront site and responds adequately to community needs.

Certainly in cities where competition for waterfront sites threatens the continued existence of valuable water-dependent uses, intervention is clearly justifiable. However, while use limitations may discourage real estate speculation and land development, these restrictions will not guarantee the continued viability of

Public access was an important objective in the development of Harbourfront in Toronto.

the allowable water-related uses. There are other public sector initiatives such as tax incentives and public improvements that work better than land use restrictions in preserving maritime uses along urban shorelines.

Portland, Maine is an excellent example of a city that has devised a waterfront management strategy to protect existing maritime uses while allowing new urban developmemt to take place. The city's waterfront area consists of approximately 250 acres, much of it vastly underutilized and occupied by transportation and warehousing/wholesaling uses.

Despite this underutilization, the area has begun a transformation. The ongoing construction of a $25 million fishing pier complex has reversed a longstanding trend of diminishing marine-related activity. The $46 million expansion of the Bath Iron Works ship overhaul and repair operation on the Portland waterfront has provided additional momentum to the resurgence of the area. At the same time, the vast development and redevelopment opportunities of the waterfront are beginning to be identified and pursued.

Faced with parallel efforts to both reindustrialize and redevelop its waterfront lands, the city formulated a strategy that would encourage commercial, retail, and residential development without jeopardizing any of the existing or proposed maritime uses. The city's waterfront management strategy is centered around new zoning recommendations.

The major recommendation is the creation of a new waterfront zone (W-2). This zone would be a specialty zone, specifically designed for the unique nature and needs of waterfront uses. Designed as a marine and marine-related use zone, its intent is to reserve a substantial portion of the waterfront for uses where waterfront access/location is critical and to protect waterfront dependent uses from other competing but noncompatible uses of the waterfront. Waterfront access for waterfront dependent uses would be guaranteed through the adoption of the W-2 zone, and noncompatible uses such as professional offices, hotels, convention centers, and residences would be prohibited.

The second major zoning recommendation is a change in text and boundary of the existing W-1 zone. The intent of the revised W-1 zone is to permit a diversity of uses which can coexist. It is a mixed-use zone that would permit all of the marine and fishing uses of the W-2 zone plus a variety of commercial, industrial, and residential uses.

Portland's strategy is exemplary because it acknowledges both water dependency and economic viability as desirable features of waterfront development. The zoning recommendations reflect the city's view of the waterfront as not just an industrial area supporting maritime uses, but also as a catalyst for urban redevelopment, economic growth, and community enhancement. It is the type of approach that other cities might find beneficial.

Providing Public Access

The issue of the public's right to have direct access to the water's edge is another controversial aspect of waterfront development. Improvements in water quality have significantly enhanced the potential waterfront lands for both private development and public use. While many local governments support the widespread public use of the water's edge, few can afford to finance it since public holdings of waterfront lands are limited. At the same time, there has been public opposition to private development projects that would restrict either physical or visual access to the shoreline.

The prevailing opinion among city officials, government agency representatives, and urban residents is that public access to the water's edge should not be limited by the private development of waterfront lands. This viewpoint is based on the premise that an urban shoreline is a public resource and should be managed to benefit the greatest number of people in the best way possible. Under this policy, private developers are encouraged to enhance the public use and enjoyment of urban shorelines by providing access to the water's edge.

Visual access to the water's edge is just as important as physical access. Waterways are special visual amenities with the potential to greatly enhance the appearance of urban environments. It is in the public interest to make sure that views to and from the shoreline are not blocked by unbroken masses of large structures.

Zoning regulations required the provision of public walkways along the shoreline at Palmer Point in Greenwich, Connecticut.

Although most private developers agree that public access to the water's edge is a worthwhile objective, they take issue with having mandatory requirements for the provision of access incorporated into the development approval process. Developers point out that rigid demands for access do not take into consideration either existing environmental variations or differences in the type or intensity of proposed project uses. They maintain that the need for providing public access should not overshadow the rights of private property owners. Local governments have to reconcile the need for access with the need for personal security and property protection.

The maintenance and management of public access areas within a waterfront development project also concerns private developers. For shoreline projects that combine various uses within public and private areas, formal written agreements should clearly define which party will be responsible for management, maintenance, and costs of each portion of the project. Jurisdictions that impose access provisions on private development projects should be prepared to provide support for maintenance and management functions.

The conclusion reached by most private developers is that public access to the water's edge can be provided in many different ways depending on factors such as the site characteristics, type of uses, and public funding. Therefore, regulations should be flexible enough to accommodate a broad range of waterfront development opportunities and to balance the public's right for access with the property rights of private landowners.

For example, instead of incorporating mandatory public access provisions into the development approval process, a better approach might be to impose access requirements that vary in relationship to existing conditions, proposed uses, and public sector goals. One criterion that should be used to determine the requirement is the existing public accessibility of the shoreline. In this respect, it seems reasonable to maintain the level of public access that exists prior to site development and to offer

incentives to encourage developers to provide public access in locations where it does not.

Attention should also be given to the quality of public access provided by developers. Depending on the circumstances, it may be better for a city to have a limited number of shoreline access points that are tastefully landscaped and complete with boat docks, parking areas, and observation decks than to have continuous access to the shoreline in the form of a pathway that lacks other basic amenities.

The public sector's desire for unobstructed access to the shoreline and the private sector's desire to develop waterfront projects are not mutually exclusive. As new projects are developed, access can be incorporated into the design and public ownership of shoreside territory clarified. In return for public investment of development projects, parks, public piers, or marina facilities can be incorporated into approved private ventures.

Citizen Participation

The role of citizen groups in the waterfront development process is another controversial issue that often generates a great deal of controversy. Shoreline development projects are usually the concern of a diverse collection of fishing interests, conservation groups, recreational boating organizations and groups such as neighborhood associations and historic preservation societies that are typically associated with urban development.

Public officials and representatives view citizen participation as an important ingredient of the waterfront development process. They argue that if private development activities are to be compatible with community values and objectives, then it is logical and appropriate to give citizens a voice in the decision-making process. The fact that shoreline development affects the condition and use of a publicly owned water resource magnifies the importance of citizen involvement. Furthermore, from the viewpoint of local government, citizen involvement in urban waterfront projects helps to enhance the quality of development.

Local governments use a variety of methods to encourage citizen involvement. Surveys, meetings, and public hearings are techniques commonly used to solicit participation. When there is strong citizen reaction to a project proposal most local governments make it the responsibility of the private developer to respond. The reasoning behind this policy is simple: the private developer is initiating an action that could have significant community impact and is therefore responsible for addressing citizen concerns. If a dispute occurs over some aspect of the proposal, it is reasonable to require the developer to have a special impact assessment prepared showing that the objection is unfounded and inconsequential or explaining how the project proposal can be revised to eliminate the cause of the objection.

Most private developers recognize the potentially mutual benefits of working closely with citizens and public interest groups. From their viewpoint, however, the potential benefits cannot be gained unless there is an orderly and systematic process to facilitate public participation. Once community input has been solicited, a reasonable approach should be used to refine the project proposal. The recommendations and objections voiced by citizen groups should be evaluated in terms of their validity and feasibility. A degree of flexibility must be maintained during this process so that a developer can explore alternative solutions to the problems identified by citizens.

ALL TOO OFTEN A MISUNDERSTANDING OF THE DEVELOPER'S INTENTIONS CREATES MISGUIDED COMMUNITY OPPOSITION

Developers contend that there must be some control over the time frame allocated for citizen involvement. The public participation process must be synchronized with the overall development process. Otherwise, delays and scheduling conflicts will significantly damage project feasibility.

Private developers and investors look to local government officials and representatives for the leadership necessary to manage citizen involvement in waterfront development. Without the commitment of local governments to work with the private sector, waterfront development is extremely difficult. The public and private sectors must work together to foster community involvement respectful of both public objectives and private property rights. Communication must be the key element of this process. All too often a misunderstanding the developer's intentions creates misguided community opposition.

It is clear that local governments and private developers share the responsibility for facilitating community involvement in the development of urban waterfronts. The process used to encourage public participation should be structured to minimize delays and uncertainty, while retaining the flexibility necessary for a developer to respond to the dynamic factors influencing shoreline development. While this balanced approach may be difficult to maintain, it is certainly worth the effort.

Adapted from an article published in Urban Land, November 1982, Volume 41, No. 11.

The Watershed Performance Zone

A Strategy for Protecting High Point's Water Supply

Realizing that a good water supply is an essential ingredient in economic development and that future water resources such as Randleman Lake are both uncertain and expensive, the City of High Point decided to evaluate its present water supply resources. The objectives of the study were to assess the quality and quantity of present water supplies, to identify potential problems, and to recommend strategies to address the problems so that the City will continue to have an adequate supply of good quality water to meet future needs.

For High Point, located in the headwaters of the Cape Fear River Basin, the main concern is the quality and quantity of the stormwater runoff from the watershed rather than the wastewater discharges from points upstream. Unlike most cities, High Point does not receive water from rivers originating outside of the area. Instead it depends entirely on stormwater runoff that results when rain falls in the watershed, accumulates and flows over the land via drainageways and small streams into water supply lakes.

The quality and quantity of the stormwater depends on the type of land use in the watershed. If the watershed contains substantial amounts of impervious surfaces such as parking lots, streets, or other pavement which cannot absorb the rain, the amount of stormwater runoff is two to four times greater than would occur with natural ground cover (See Figure 1). With this increase in the volume of runoff, more flooding occurs and groundwater supplies are not replenished. Impervious surfaces also collect petroleum products, toxic and heavy metals, litter, and other substances from motor vehicles and building materials. These pollutants along with fertilizers, pesticides and other contaminants from lawns, gardens and fields become part of the stormwater runoff that is washed into the lakes and thus adversely affect the quality of the water supply.

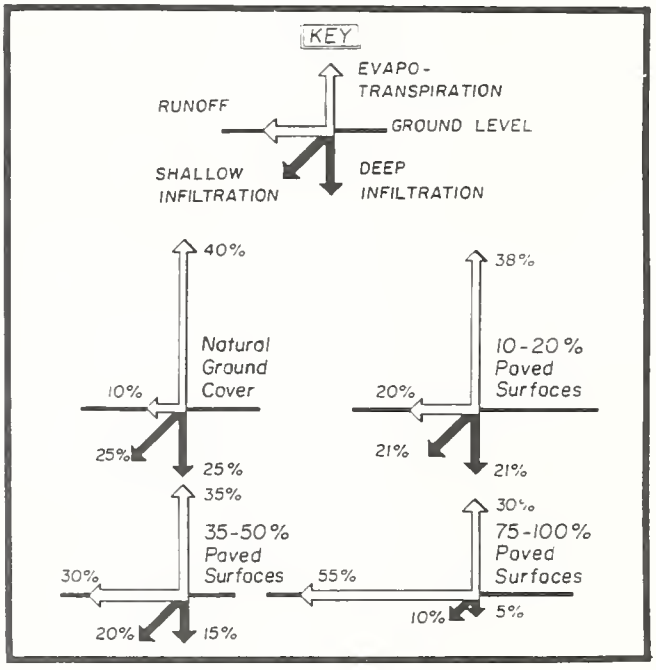


Figure 1. Typical hydrographic changes due to increasing area of impermeable paved surface in a developing area.

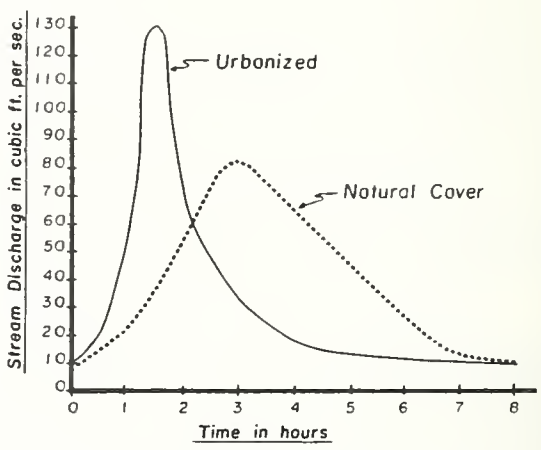


Figure 2. Contrast in stormwater runoff discharge/time in urban and forested land uses for a one hour storm event on two small streams draining similarly-sized areas.

Impervious surfaces also speed up the flow of stormwater since there is no vegetation to slow the water and no soil to absorb it (see Figure 2). At higher velocities, larger amounts of stormwater can cause extensive erosion as the runoff scours the landscape on its way downstream. Substantial amounts of impervious surfaces in a watershed will result in more stormwater which causes larger floods and depletes groundwater reserves, more sediment which diminishes the capacity of the reservoirs, and more pollutants which degrade the quality of the water supply.

Mary Joan Pugh is Associate Director of the Department of Planning and Development in High Point, N.C.

Maximum Point Value	LAKE MANAGEMENT RATING SYSTEM — RESIDENTIAL Factor	Point Value	Points Earned
20	1. Density - low density and clustering of development in developable areas		
	<40,000 sq. ft. subdivided	0	
	40,000 sq. ft. - 2 acres subdivided	5	
	<40,000 sq. ft. single estate	5	
	> 2 acres subdivided	10	
	40,000 sq. ft. - 2 acres single estate	10	
	2-4 acres single estate	15	
	> 5 acres single estate	20	
	Planned Unit Development	20	
20	2. Impervious Surface - low percentage of non-permeable surface		
	0-3%	20	
	3-7%	15	
	7-10%	10	
	10-15%	5	
	> 15%	0	
25	3. Proximity to Lake, Deep River, Boulding Branch - long distance from the Lake or major tributary		
	> 2000 ft. from nearest point of Lake or stream	25	
	1000-2000 ft.	20	
	500-1000 ft.	15	
	100-500 ft.	10	
	50-100 ft.	5	
	50 ft.	0	
10	4. Soil Type - suitable for residential development		
	suitable for development	10	
	moderately suitable	5	
	unsuitable for development	0	

Figure 3. An excerpt from High Point's Lake Management Rating System for residential areas. Copies of the full rating system for both residential and nonresidential areas are available from Mary Joan Pugh, Department of Planning and Development, P.O. Box 230, High Point, NC 27261.

According to yearly averages of sample data collected weekly, the water quality of both High Point water supply lakes is excellent. However, a water quality study conducted during the summer of 1980 noted several occurrences which indicated that increased development in the watershed will affect the water quality of the lake.

In one instance, the level of nitrate, a nutrient that contributes to the rapid growth of algae and other problem plants, increased from 0.8 to 2.0 parts per million in one stream after a light rain. It was discovered that the nitrate in the fertilizer that was applied to a lawn in an apartment complex near the stream accounted for the unusually high nitrate reading.

In addition, in a study of water supply lakes conducted by the North Carolina Division of Environmental Management, Oak Hollow Lake and High Point City Lake were rated on a scale of 1 to 6 (6 being the most eutrophic or poorest quality due to excessive amounts of nutrients and oxygen deficiency). It was determined that City Lake, which is over 50 years old with less development within its watershed, rated a 4 whereas Oak Hollow Lake which is only 10 years old with substantially more development already rated a 3. Eutrophication is a natural aging process in which all lakes are eventually rendered useless, and Oak Hollow Lake is aging faster due to development within its watershed. Unless measures are taken to control the quality of stormwater runoff entering the lake, it will continue to age at an accelerated rate.

After identifying uncontrolled stormwater runoff from development in the watershed as a threat to High Point's water supplies, ways to manage the quality of the stormwater were examined. Like all nonpoint sources of pollution, stormwater runoff does not originate from any discernable points, and is a difficult source of pollution to control. However, since the first flush of stormwater runoff carries 70 to 90 percent of the sediment and pollutants, the amount of these pollutants can be substantially reduced by controlling this first portion of runoff.

Therefore, most methods for managing runoff attempt to control the source of the runoff by regulating the type and intensity of land use in the watershed through zoning. High Point chose to manage its land use by means of a watershed performance zone. The performance zone is an overlay district with performance standards which must be met in addition to the zoning requirements. The performance standards are in the form of a rating system based on the factors that were found to affect the impact of stormwater runoff on the quality of a water supply (See Figure 3). The factors are:

1. Density or building coverage
2. Amount of impervious surface
3. Proximity to the lake or major tributary
4. Soil type
5. Type of drainage system
6. Slope
7. Land cover
8. Runoff control strateties
9. Sewage disposal
10. Road and driveway design

Each of these factors was given a specific value based on its relative effect on stormwater quality in the High Point watersheds. The rating system was tested thoroughly and 100 out of

continued on page 34

North Carolina in Ruins?

The State Role in Financing Local Infrastructure

Over the last two years there has risen a growing public concern about the state of the nation's infrastructure; that is, public facilities, highways, water supply, and wastewater treatment services. The genesis of this concern was the 1981 book, America in Ruins, by Pat Choate and Susan Walter. Choate and Walter argued that:

> "America's public facilities are wearing out faster than they are being replaced. Under the exigencies of tight budgets and inflation, the maintenance of public facilities essential to national economic renewal has been deferred. Replacement of obsolescent public works has been postponed. New construction has been cancelled... Without attention to deterioration of that infrastructure, economic renewal will be thwarted, if not impossible. We have no recourse but to face the complex task at hand of rebuilding our public facilities as an essential prerequisite to economic renewal."

In North Carolina there is currently an estimated $3 billion backlog of needs to repair and replace obsolete, temporary, and deteriorating facilities in highways, sewer, and schools alone. The number of inhabitants in North Carolina is expected to increase by 17 to 25 percent by the year 2000, requiring the state's infrastructure to support between 900,000 and 1.4 million more people and up to one-half million more households. Employment is predicted to increase at approximately twice the rate of population growth. The level and location of major private sector capital and other investment decisions will likely be influenced by the quality of infrastructure available and whether or not a sound program for maintenance and expansion exists.

THERE IS CURRENTLY AN ESTIMATED $3 BILLION BACKLOG OF NEEDS TO REPAIR AND REPLACE FACILITIES IN HIGHWAYS, SEWERS, AND SCHOOLS

Concern over these factors prompted a recent study through North Carolina's Department of Natural Resources and Community Development (NRCD) on the state's infrastructure needs in highways, water supply, wastewater collection and treatment, and education. The study compares projected costs and revenues for capital improvements in these four areas which have been judged vital to economic development and to the future quality of life in the state. Alice Garland-Swink of the Office of the Assistant Secretary for Policy Development (NRCD), guided and assisted with the study, and Professor Edward J. Kaiser of the Department of City and Regional Planning, University of North Carolina at Chapel Hill, supervised and co-authored the original report.

This article will focus on the three areas in which state and local governments have traditionally shared responsibility for capital investment: drinking water supply, wastewater collection and treatment, and primary and secondary school facilities. In the past the state has financed its share of costs for water and sewer facilities by issuing Clean Water Bond Acts in 1971 and 1977. The state has also issued bonds for school facilities in several years since 1949.

In 1983 the North Carolina legislature dramatically changed means of both collecting and distributing the state portion of infrastructure funding. House Bill 426 gives North Carolina counties the option of raising the local sales tax by one-half percent. All revenues from the increase are placed in a pool and redistributed to counties in proportion to their population. Each county must then share a portion of its revenue with every municipality within its bounds, based on the city/county proportion of either population or total property taxes. In the first five years of the tax, counties must spend at least 40 percent of their share on public school capital needs, and cities must spend 40 percent of their share on water and sewer capital outlay. In the next five years these percentages drop to 30 percent. The bill also withdraws authorization for a third issue of Clean Water Bonds that the legislature had previously approved.

This paper will explore capital investment needs and projected revenues to meet those needs before and after the enactment of the one-half percent local option sales tax. The three affected areas of infrastructure -- water supply, wastewater treatment, and primary and secondary

William J. Drummond is a PhD candidate, and Kathleen M. Heady is a Master's candidate in the Department of City and Regional Planning at the University of North Carolina-Chapel Hill.

schools -- will be discussed in turn. The final section will evaluate changes occurring as a result of the legislation in terms of two major questions: 1) Why should (or should not) the state be partially financing infrastructure in this area? and 2) Is the one-half percent sales tax a good way to do so?

Water Supply

North Carolina has a sufficient, if not abundant, supply of high quality water. Yet the state's growing population, continued industrial development, and dispersed settlement pattern will place increased pressure upon local governments' ability to provide drinking water in sufficient quantity and quality.

Since water provision is primarily a local responsibility, North Carolina has a large number of relatively small water systems. Of the state's 427 municipal systems only fifty have 500 or more customers, and only ten serve more than 10,000 people. About 11,000 more non-municipal systems dot the state.

A growing number of the state's municipal systems are reaching capacity. Statewide, an estimated 96 systems will reach or exceed capacity by the year 2000, for a deficit in treatment capacity of 117 million gallons per day.

The cost of meeting these needs is difficult to calculate. A 1981 Department of Human Resources study found about $640 million in needs over the period from 1982 to 1987, but no statewide figures beyond 1987 are available. Assuming that 30 percent of the 1987 needs are backlog needs, we can determine that $183 million represents current needs, while the remainder represents yearly needs of $91 million. If annual needs remain at this level, the total year 2000 needs for North Carolina will be $1.83 billion. This is a very rough estimate, but a more reliable figure is not available.

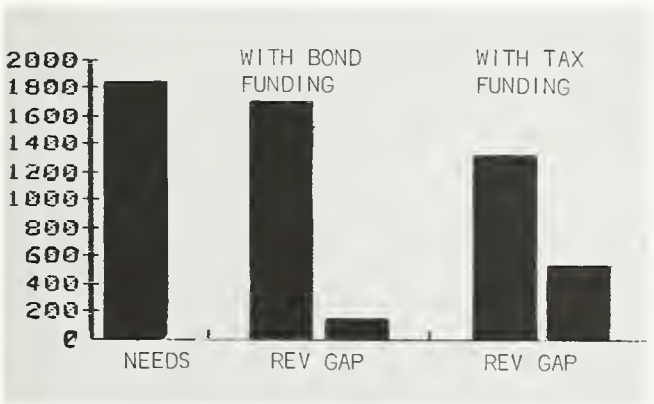


Figure 1. North Carolina drinking water supply financing, in millions of 1982 dollars.

The greatest portion of the burden of water supply financing has been borne by local governments, with some state aid and a small amount of federal help. The local monies have been raised primarily through the issuance of local general obligation bonds, $433 million in the last decade. State aid has been provided through the Clean Water Bond Acts of 1971 and 1977. These grants have totaled $185 million, while federal aid from various sources has accounted for $102 million.

Figure 1 indicates drinking water supply funding situations with bond or tax funding through the year 2000. Assuming that federal and local funding continue at current levels, by the year 2000 federal aid will amount to $107 million, and local monies raised will be $1,085 million. If the state had continued Clean Water Bond funding, its share would have been $493 million, about $24 million per year. In this case total revenues would have been $1.69 billion, compared to needs of $1.83 billion. A shortfall of $143 million, less than 8 percent of the total, would have resulted.

However, the new one-half percent sales tax has replaced Clean Water Bond funding. Optimistic projections of sales tax revenue predict that an average of $7.5 million per year will be made available for water projects, less than one-third of the $24 million provided by Clean Water Bonds. From all sources, local, state, and federal, revenues will total only $1.31 billion, leaving a shortfall of $517 million, all to be borne by local governments. This shortfall is almost half of the projected local revenues.

Wastewater Collection and Treatment

Over the last ten years North Carolina has made substantial progress in cleansing its streams, rivers, and lakes. Yet, almost 50 percent of the state's municipal treatment facilities do not meet federal water quality standards, and there are development moratoria in more than 100 North Carolina towns because of inadequate waste treatment plants.

The EPA 1982 Wastewater Needs Survey found $1.77 billion in North Carolina needs, with $1.07 of the total made up of backlog needs. Compared to the United States average, North Carolina's needs are more focused upon catching up with demand for system expansion and requirements for improved treatment.

Unlike water supply, wastewater treatment has seen heavy federal involvement in funding. Since 1972, most sewer projects have received 75 percent federal funding from EPA Section 201 grants, 12.5 percent state funding from Clean Water Bonds, and 12.5 percent local funding, mostly from general obligation bonds. From 1973

to 1982, funds from all federal sources totaled $635 million, the state contributed $155 million, and local revenues were $241 million.

The Reagan Administration has drastically reduced Section 201 funding, and in the future North Carolina will receive about half the annual funds it did previously. If current federal funding levels continue until the year 2000, altogether the state will receive $895 million. Since the U.S. will provide only 55 percent of future project funding, an additional $879 million in state and local funding will be required to secure these federal monies.

Since 1972 there has been a downward trend in local sewer funding. Assuming the continuation of this trend, by the year 2000 about $369 million in local funds will be raised. Figure 2 shows the North Carolina situation if Clean Water Bonds had been continued, contrasted with the state's one-half percent sales tax use for

ALMOST 50 PERCENT OF THE STATE'S MUNICIPAL TREATMENT FACILITIES DO NO MEET FEDERAL WATER QUALITY STANDARDS

funding local sewers. It is evident from the table that the matching fund problem has become even more severe. Since local needs amount to $1.77 billion, there will be a massive $688 million shortfall with use of the half percent sales tax. Of that shortfall, $296 million in added federal funds could be secured, but local governments still need to raise an extra $392 million beyond the projected $369 million. In short, local governments will have to double their sewer expenditures if all the year 2000 needs are to be met.

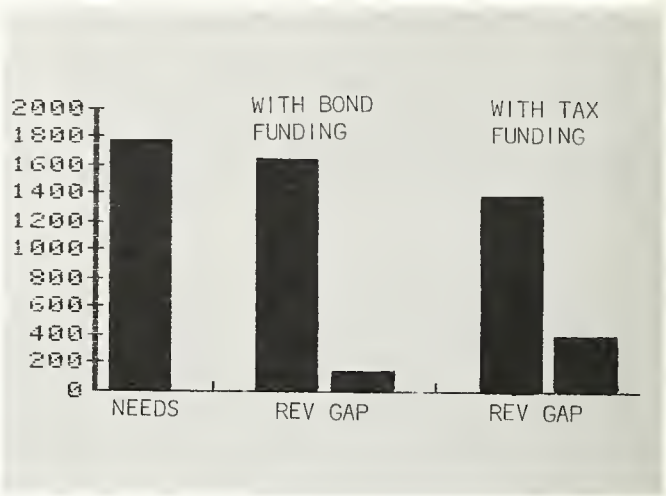


Figure 2. North Carolina wastewater treatment financing, in millions of 1982 dollars.

Primary and Secondary Schools

North Carolina counties are responsible for providing primary and secondary school construction, repair, and maintenance. The state has, however, periodically provided funds for these activities since 1949 by issuing state school facility bonds. A total of four state bonds have been issued, the most recent in 1973. The last two bonds, in 1963 and 1973, were distributed on the basis of average daily attendance and could be used to retire local school bonds (although a majority of the funds were used to improve or construct facilities). From 1971 to 1981 local governments contributed an average of 71 percent, state government 24 percent, and the federal government 5 percent of the capital costs of schools.

Table 1
NORTH CAROLINA INFRASTRUCTURE PROJECTED NEEDS AND REVENUES
1983-2000
(MILLIONS OF 1982 DOLLARS)

		PROJECTED REVENUES							
				WITH BOND FUNDING*			WITH SALES TAX**		
AREA	PROJECTED NEEDS	FEDERAL	LOCAL	BONDS	TOTAL	GAP	TAX	TOTAL	GAP
SCHOOLS									
CONSTRUCTION	3420	267	2460	400	3127	293	643	3370	50
MAINTENANCE	2160	0	984	0	984	1176	0	984	1176
TOTAL	5580	267	3444	400	4111	1469	643	4354	1226
WATER	1829	107	1085	493	1685	144	120	1312	517
SEWER	1774	895	369	370	1634	140	120	1384	390

* Assumes continuation of Clean Water Bonds and School Bonds at previous funding levels.

**Assumes 100 counties participating and 6% annual increase in sales, with 3% inflation.

Over 27 percent of the classrooms currently in use in primary and secondary schools were constructed before 1949, 29 percent were built between 1950 and 1959, and 44 percent have been constructed since 1960. The oldest buildings often have serious deficiencies, and many of those built in the 1950's require extensive renovation. Currently, more than 4,500 temporary and improvised classrooms are in use across the state.

Based on a 1978 survey and updated estimates by the Department of Public Instruction, and our own independent projections for the period beyond 1990 (based on a percentage of replacement cost), total capital improvement needs for construction and renovation are estimated to be $3.42 billion through the year 2000. School administrators generally agree that a minimum of two percent of replacement costs, estimated at about $6000 per pupil in North Carolina, should be budgeted for the maintenance of facilities. This would require expenditures of $120 per pupil or approximately $2.2 billion over the 18-year period, (funded out of current revenues).

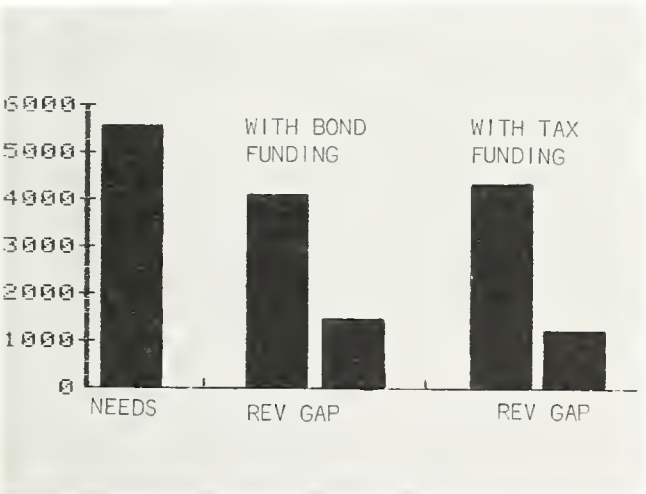
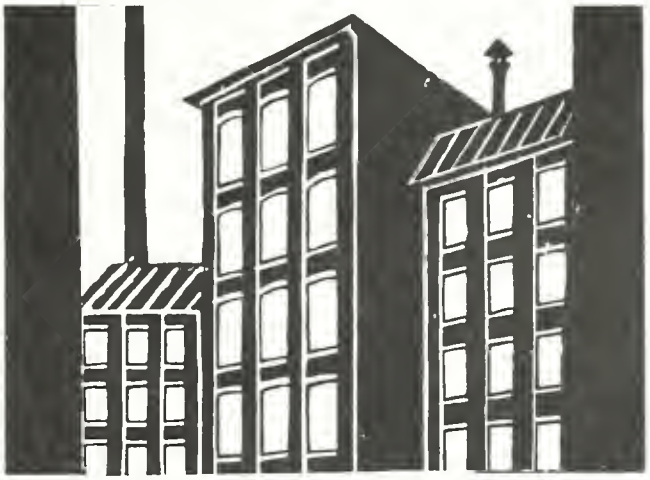


Figure 3. North Carolina primary and secondary school financing, in millions of 1982 dollars.

No further state school bond issues are anticipated in the near future due to the recent authorization of the local option one-half percent sales tax. A moderate local revenue estimate, based on trends in county revenues and the proportion devoted to school capital outlay, yields $2.5 billion for the 18-year period. If the federal government continues to provide 4.8 percent of total requirements as in the 1970's, it will contribute approximately $267 million. Total revenues without state participation equal $2.7 billion, or $693 million less than estimated needs. The school's capital outlay share of the counties' portion of the one-half percent sales tax increase is estimated to be $643 million over the 18 years, leaving a gap of $50 million.



Maintenance expenditure requirements were projected to be approximately $2.2 billion. The average amount spent on maintenance per pupil in 1980-1981 was $54.65 or 45.5 percent of the recommended $120. If 45.5 percent of the recommended level is funded through the year 2000, only $984 million will be spent on maintenance, or $1.2 billion less than the recommended level.

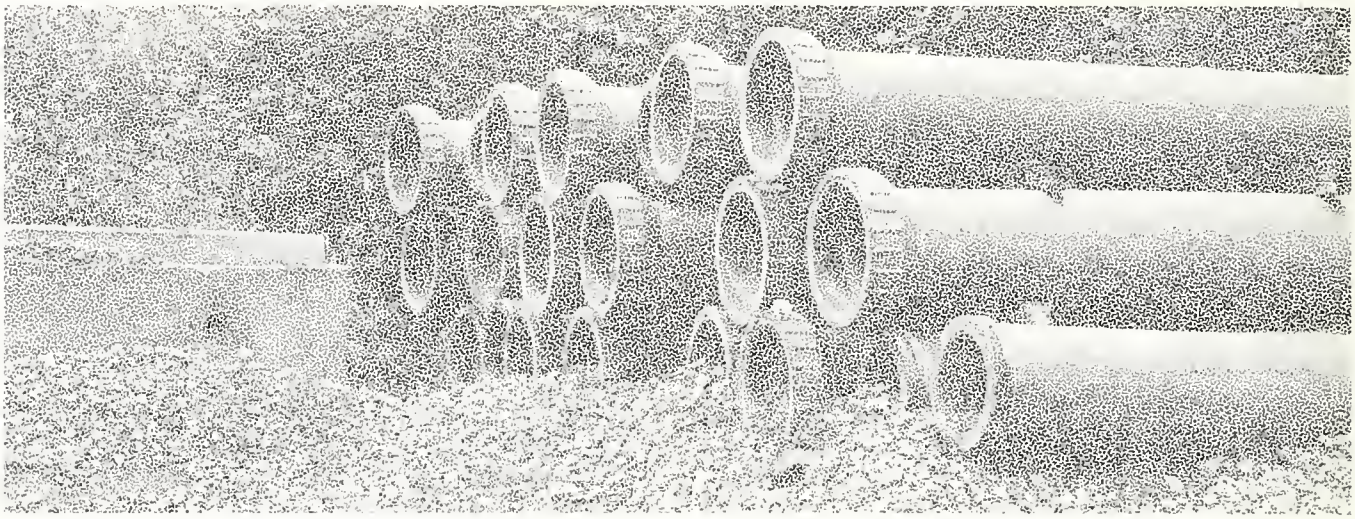
A total gap for schools for the 18-year period is $1.87 billion before enactment of the sales tax and $1.23 billion after. Local governments will be responsible for meeting virtually all of the construction, renovation, and maintenance needs if the current funding situation persists through the year 2000.

Conclusions

The one-half percent sales tax represents a new direction for the financing of the states's share of local infrastructure. Among the many issues raised by this change are three that are particularly important. First, how much revenue will be raised for water, sewer, and schools?

THE CHIEF EFFECT OF THE SALES TAX IS TO REMOVE THE STATE FROM ANY ACTIVE ROLE IN LOCAL INFRASTRUCTURE FINANCING

The North Carolina Department of Revenue projects that with all 100 counties participating and a six percent annual growth rate, $1.7 billion will be raised over the next ten years. Assuming a three percent inflation rate, the year 2000 total becomes $2.8 billion (in 1982 dollars). Of that amount, $643 million will be dedicated for schools, and $240 million for water and sewer projects. These amounts could be substantially higher if local governments use undedicated sales tax funds as well, but the totals could also be lower since the dedicated funds can be used to retire debt from past expenditures.



Second, how well will the tax funds be matched to local needs? Not very well. Areas will receive funds based on population or property tax revenues, not needs. Since school bond monies were distributed largely by attendance levels, this is not a significant change. In contrast, Clean Water Bond distribution was determined mainly by need. It is probable that water and sewer money will not be as well spent as it was under the Bonds.

Third, the chief effect of the sales tax legislation is to remove the state from any active role in local infrastructure financing. Localities have been granted an additional revenue source, but in the long run they will have to shoulder the entire burden. It may turn out to be a high price to pay for the added revenues.

We will now consider the impacts of the new legislation on each area of infrastructure and, in particular, the fundamental question: should the state be involved?

Of the three areas, state involvement in water supply infrastructure seems the least necessary. By and large, the local residents who benefit from water supply infrastructure are those who pay for it. There is some inequity due to the accidents of history and geography that make water provision more expensive for some communities than for others. Yet the revenues from the tax seem to adequately represent the state responsibility. Although the needs/revenue gap is large ($517 million), when localities need water they are usually able to find the means to pay for it.

The situation in wastewater treatment is much different. For the most part, those local areas which must pay for treatment are not those which benefit from it. Because such large economic spillovers exist, there is a strong rationale for state involvement in the provision of wastewater financing. Well-conceived and strictly-enforced water quality regulations will help, but both the carrot and the stick are necessary. Projected local revenues total only $369 million, and these must be increased by 65 percent (to $612 million) if all the available federal funding is to be secured. An increase of 105 percent (to $759 million) will be necessary to meet all projected needs. Unless the state reassumes an active role in wastewater capital financing, North Carolina will carry a massive backlog of needs into the next century.

The responsibility for maintenance, renovation, and construction of primary and secondary schools rests with counties even though the state has been providing funds for capital investment needs since 1949. Additional revenue from the state sales tax, approximately $643 million, is sufficient to meet facility requirements. However, needs vary across counties. Those counties with few requirements can use the extra revenue to retire local school bonds while those with significant needs or a smaller tax base may not be able to fund facilities adequately. The major gap will occur in maintenance of plant, where the state has traditionally played a small role. Section 15 of the Declaration of Rights of the Constitution of North Carolina states, "The people have a right to the privilege of education, and it is the duty of the state to guard and maintain that right." If the lack of adequate facilities in a county is interfering with that right, it may be the duty of the state to intervene and provide funds for meeting facility needs.

Will the future find North Carolina's infrastructure in ruins? In general, the picture is not discouraging. Adequate school capital funding seems probable, with water funding somewhat less certain. Only in the area of wastewater treatment is the situation potentially alarming. Here, if anywhere, we can expect insufficient investment in infrastructure to thwart North Carolina's continued economic growth.

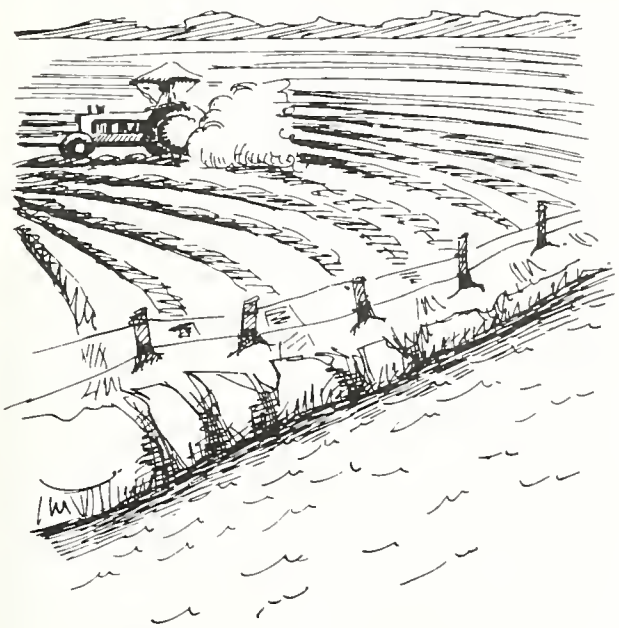
Todd Miller

Carolina Blue

Preserving State Water Resources

Coastal North Carolina has about 2.3 million acres of marsh, wetlands, creeks, rivers, and sounds, making up the largest estuarine system on the Atlantic Coast. Productivity of fish and shellfish breeding in this system depends upon an influx of nutrients and fresh water from upland areas. The health of this estuarine system is a good indicator of how well water resources are being protected in North Carolina. Fresh water enters the estuaries from rivers including the Cape Fear, Neuse and Roanoke, which drain millions of acres of the Piedmont and Coastal Plain.

Thus, Mark Dodge's conversation with two Winston-Salem newspaper reporters one hot afternoon last summer, concerning hard times experienced by commercial fishermen, should be taken seriously throughout North Carolina. His living depends on crabbing, oystering, and a boatyard near Rose Bay in Hyde County. Mark Dodge and most other commercial fishermen believe that the conversion of over 200,000 acres of freshwater wetlands by non-family corporate farms in five coastal counties has polluted saline fish breeding areas with fresh water and farm chemicals. These large agricultural interests disagree with Mark Dodge's assessment, claiming that many complex factors have caused seafood catches to decline. Between the two interests there is no consensus on what is happening to coastal water quality.



So when politically powerful out-of-state investors, with almost a half billion in federal subsidies, propose to strip mine 15,000 acres of peat bogs in Washington and Hyde counties, fishermen like Mark Dodge are seriously worried about their future livelihoods. But it is difficult to fight back because of the difficulty in proving what they only know from experience: that changes which funnel fresh water into the estuaries destroy fishing.

This inability to measure the effects of land use projects on water resources frustrates efforts to protect the nation's waters. The U.S. General Accounting Office stated in 1977 that less than one-half of the pollutants from agriculture and forestry activities as well as urban devlopment are major problems. This report was reaffirmed by the President's Council on Environmental Quality in 1980, which found that in contrast with progress made in controlling highly visible industrial and municipal discharges, there had been practically none in cleaning up land runoff.

Because municipal and industrial discharges are not completely understood or controlled, the total threat to water resources posed by land runoff is unknown. This is evidenced by a recent North Carolina study which found that "biocides" -- chemicals used to kill bacteria and other microorganisms -- are being discharged into state streams. "It makes you wonder how many other things are down the pike," said David Howells, a North Carolina Environmental Management Commission member, when he expressed alarm in a recent newspaper article about the report. Howells explained his concern another way. "What business do we have classifying water A-2 (for drinking) about which we do not have definitive information?"

In addition to the problem that water resource regulations do not cover the broad array of pollutants being discharged, another major concern is the inability of regulatory agencies to come to grips with the cumulative effects of land use on surface and groundwater resources. Regulations are based on the concept that it is okay to pollute as long as discharges do not exceed the capacity of nature to handle them.

Todd Miller works full-time for the North Carolina Coastal Federation, a non-profit public interest group involved in efforts to protect coastal water quality.

While one project or land use by itself may not be enough to cause significant water resource problems, more activities, identical or otherwise, may be completely unacceptable.

The environmental impact study is one of the few regulatory constraints on cumulative effects of development. Under guidelines adopted by the Council on Environmental Quality, the total impact of any significant federal action must be determined prior to its initiation. Federal actions include the expenditure of tax dollars or the issuance of permits. Unfortunately, prediction of significant adverse cumulative impacts is difficult. In addition, most land use activities are not considered major federal actions and a review of cumulative impacts is not required.

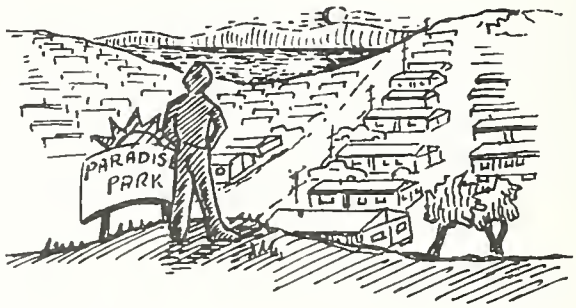
Another factor resulting in continued degradation of water resources is lack of public awareness that problems exist. Coastal fishermen know that catches are dwindling: their firsthand observations of natural changes lead them to suspect uncontrolled land development. But the urban dweller is not so closely tied to the environment, and finds it easy to assume that what flows from the tap is safe to drink.

This apathy exists in spite of the everyday press reports of contamination of drinking water supplies. The Council on Environmental Quality reported in 1972 that over 90 percent of the nation's watersheds are more than "moderately" polluted. Tests of drinking water in 113 cities during 1976-77 revealed at least traces of toxic chemicals, including carcinogens, in every metropolition area studied. Although pollution causes are well-known to public health officials, a recent survey showed that 61 percent of the municipal water supply watersheds in the Southeast are completely unprotected from "source" pollution.

Few North Carolina water system managers believe they have water quality problems, according to a recent survey conducted by the Center for Urban and Regional Studies of the University of North Carolina. Complacency exists despite findings by the survey that "most water supply reservoirs will lose considerable capacity because of sediment from agricultural activities; most water supply watersheds are expected to have more industrial, commercial, and residential development in the next ten years; and most systems will find it necessary to turn to more developed watersheds for future supplies."

This same survey found that while a few local governments have acted independently to protect their drinking water, the vast majority of communities have done nothing. Effective measures to control land uses that degrade water resources will be adopted by localities only as a result of pressure from state and federal agencies. Most communities have absolutely no one capable of recognizing the need for watershed management.

In spite of this, state and federal agencies are extremely timid in protecting North Carolina's water resources. Over 200,000 acres of freshwater wetlands were destroyed in coastal North Carolina during the 1970's, a period in which the District Colonel for the U.S. Army Corps of Engineers said that the Corps had been "exceedingly lenient in the application of the law and regulations."



In instances where Carolina law applies to the protection of water resources, the approach of state agencies is to let projects go forward, being permissive while attempting to minimize environmental damage. As Dave Owens of the North Carolina Office of Coastal Management describes their approach in a recent magazine article, "We're not prohibiting development; we're managing it."

This state regulatory philosophy accepts tradeoffs between new development and its possible adverse effect on water resources. In order for it to work, however, the agencies must be able to determine the price, based on an estimate of possible pollutants and their present and future impacts. This type of analysis is not encouraged by present water resource protection laws.

On-site engineering to minimize water resource impacts resulting from land use activities is frequently used to make projects more environmentally acceptable. However, sooner or later many runoff control measures fail due to poor engineering, improper installation, or lack of maintenance.

For years Florida has championed a philosophy of trying to manage the environment to reduce flooding and water quality problems, and to provide adequate supplies of clean drinking water. Now, according to Wayne Voight, Staff Director of the Florida Senate Natural Resources and Conservation Committtee, "We have a changing attitude that is much more cautious about replacing natural with man-made (water management) systems."

Continued on page 42

MANAGING, continued from page 7

STRUCTURING OF SOUTHERN STATE WATER MANAGEMENT PROGRAMS

State	General Approach	State Structure	Type of Region	Regional Structure: Number of Regions	Regional Structure: Complete State Coverage	Regional Structure: Basis of Boundaries	Regional Structure: Governing Body Composition
Florida	State/Regional	Single Agency	Water Management Districts (WMD); regional offices of state agency (DER)	5 WMDs and 5 DER regional offices	Yes	Watershed boundaries	Unpaid Board of Directors appointed by the Governor; not applicable to DER offices
Georgia	Statewide	Singel Agency	N/A	N/A	N/A	N/A	N/A
North Carolina	Capacity Use Area	Single Agency	Capacity Use Area (CUA)	1 CUA	No	"Area Affected" (basically underlying aquifer) follows county, natural, and highway boundaries	EMC (state committee) appointed by the Governor to administer CUA
South Carolina	Capacity Use Area	Multiple Agencies	Capacity Use Area (CUA)	2 CUAs	No	"Area Affected" follows natural boundaries, county lines, and highways (local initiative)	Water Resources Commission appointed by governor.
Virgina	Capacity Use Area	Multiple Agencies	Groundwater Management Areas	2 GMAs	No	"Aquifer Affected" boundaries set by state	Legislation allows for advisory committee composed of residents of GMA (not created)

1. State sructure encompasses both quality and quantity based on agency authority to issue NPDES permits and withdrawal permits.
2. There are 37 Watershed Districts, which do not cover the state. Primary function of these WDs is soil and water conservation. However, they are empowered to issue water quantity permits stricter than those issued by the state; apparently none do so.

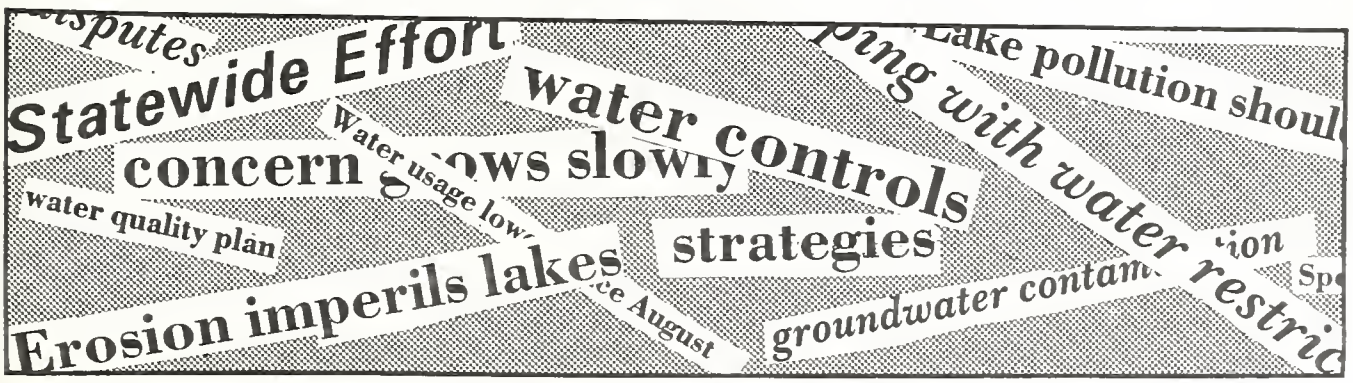
agricultural use of water but whose farmers are not generally receptive to water management efforts. The political power of rural interests in these states makes it difficult to address this problem. Even Florida is experiencing this problem in the northwestern part of the state where the water management district has not fully addressed agricultural water use.

When Georgia's first water use law was passed in 1972, concern centered on the unrestricted industrial and municipal use of groundwater in the coastal area threatening the region with intrusions of salt water from the Atlantic. The intent was to create capacity use areas in the coastal region. Since agricultural water use was not great there nor statewide, the law was amended on the floor of the House of Representatives to exempt agriculture from the program. What was not foreseen was the substantial increase in irrigation that occurred in the late 1970's and early 1980's. Irrigation increased from being a minor user of water in 1970 to the major consumer of water in Georgia by 1980. According to Robert R. Pierce and Nancy L. Barber in Water Use in Georgia, 1980 (Atlanta: Georgia Department of Natural Resources, 1982), current installed pump capacity for irrigation systems in the state is nearing 50% of the water used for all other purposes on a daily basis. Obviously the exemption of such a major water user from the water management program undermines the program and jeopardizes the resources for all water users.

In 1982 the General Assembly passed legislation to require major irrigators to report annually to their Cooperative Extension agent the amount of water used on a monthly basis. Although this provides information on water usage, it does not provide irrigators with the legal rights to use water nor does it provide EPD with the necessary authority to fully manage the state's water resources. Thus a mechanism for including agricultural water use in the state's water management program will have to be implemented in order to improve the effectiveness of Georgia's program.

Conclusions

Although water management in the southeastern states is a fairly new concept, the region is ideally suited for this approach. As sunbelt growth increases demands on the water resources, states will become increasingly interested in instituting mechanisms that will accommodate development while protecting their water resources. It is important that as state legislators struggle with water resource issues they avoid creating legal and organizational barriers which prevent the effective management of the water resources.



Sue K. Snaman

What Are We Gonna Do With Those Package Plants?

Construction of two major water impoundments in the Triangle area has placed local governments in the hot seat. The Falls of the Neuse and the Jordan Reservoirs were built for water supply, recreation, and flood control. Due to the scenic and recreational qualities, they have also inspired a tremendous increase in residential development.

County Health Departments have an important role in protecting water supplies at a time when regulatory responsibilities of state agencies are in transition, with new regulations effective January 1984. As more and more developers elect to construct private wastewater treatment facilities, the control of public health problems has county health departments worried.

Issues of public management of private wastewater systems concern conventional on-site disposal systems serving individual homes or several homes, as well as on or off-site community systems such as treatment works, spray irrigation, or land application of treated wastewater. Package treatment plants have recently received the most attention. The term "package plant" is often used to describe any small discharging wastewater system serving a group of homes. More accurately, package treatment plants are smaller versions of conventional sewer system which have been transported to the site in modules. Package treatment plants are available in various treatment capacities as well as treatment levels.

Ongoing problems with malfunctioning private systems and package treatment plants go beyond public health concerns and hit the municipalities squarely in the pocket. Who pays for necessary repairs or replacement when the private wastewater system fails and the public sector must step in to operate and manage?

Why Manage?

Public management of private wastewater systems, as one element of a watershed protection program, has several purposes. Protection of drinking water supply is of prime importance. So is the lowered costs to downstream jurisdictions of treating relatively pure water over treating polluted water. There is also the benefit of recreational uses around the reservoir. Recreation and supporting services can mean economic gain to the community.

The public agency has reason to be wary. Pollution from failing wastewater treatment works can dump increasing levels of nutrients into a lake until the water chokes with algae. Potential benefits from recreation -- not to mention use as a water supply may all go down the drain at that point. The same situation can occur where a concentration of septic systems fail. In general, community wastewater systems pose more acute problems.

When a private wastewater system performs according to expectation, regulatory concerns are often perceived as irrelevant or overly burdensome. Yet if and when problems arise, the responsible public agency needs to be assured of methods to protect this large public investment in addition to meeting public health concerns. Also regulation requires a supply of money to assure that repairs are made.

Who Manages?

Experience has shown that homeowners are typically unknowledgeable of maintenance and operation of any system which is not connected to a municipal sewer. The county health department has traditionally approved operation of conventional and alternative septic systems according to specifications set by state agencies. Regulation of size, design, and operation of these systems has been shared by the North Carolina Department of Human Services and the Division of Environmental Management within the Department of Natural Resources and Community Development.

EXPERIENCE HAS SHOWN THAT HOMEOWNERS ARE TYPICALLY UNKNOWLEDGEABLE OF MAINTENANCE AND OPERATION OF ANY SYSTEM WHICH IS NOT CONNECTED TO A MUNICIPAL SEWER

Management Options

Because local health departments are obliged to protect public health and water resources from adverse natural and man-made or irreparable malfunctions of wastewater systems,

Sue K. Snaman is a Master's candidate in the Department of City and Regional Planning at the University of North Carolina-Chapel Hill.

the public agency may be required to take over operation. The density of the service area, failure rate, and the vulnerability of the water body will determine the level of management needed.

Local communities may involve themselves in wastewater management in any of the following ways:

- regulation of individual on-site disposal systems only
- regulation of community systems which discharge only
- design and construction of wastewater systems
- operation and maintenance of wastewater systems

Regulation only supports the status quo whereby regulatory standards governing the type and sizing of approved wastewater systems are set by the state. Local health departments are then delegated responsibility for inspection and monitoring of ongoing operation. Within this option, the chief actors may include the county health department and the executive commissions of two separate state agencies. Other agencies such as the Coastal Resources Commission or certain city/county arrangements may also be involved.

At a more intensive level of public involvement, the city or county may assume additional responsibilities such as increased inspection; septage disposal; maintenance and repair of equipment; financing through fees, taxes, or special assessments; and administration of the community system.

This higher level of involvement by the city or county necessarily incurs a greater cost to the local treasury. Many counties have a slight edge over cities in this regard due to a generally larger tax base. In the case of county administration, authority could be vested in the county health department, environmental health section, or utilities department.

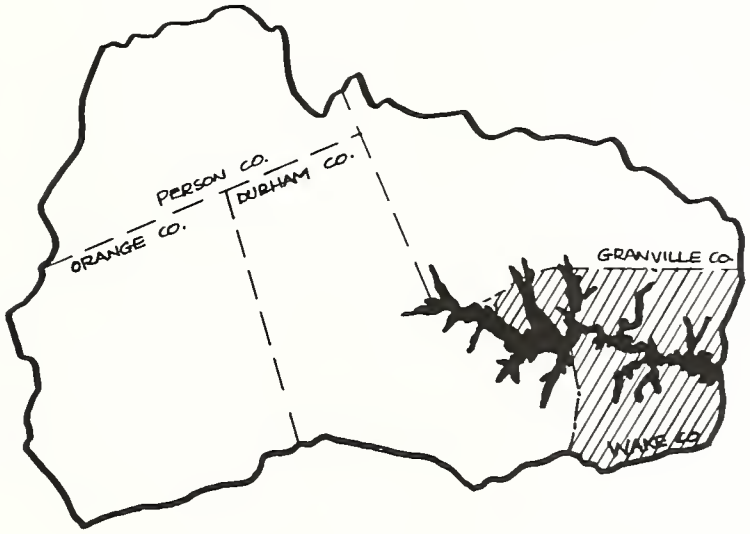
Public and Private Concerns

A full system of management options need not be fully administered by the public sector with all work performed directly by government personnel. Private firms under contract to the government can provide much of the operation and maintenance directed by the county. Growing numbers of engineering firms or manufacturers of wastewater treatment facilities now offer these services. Again issues of system performance and liability remain a priority interest of public agencies.

A developer approaches the wastewater treatment needs of a proposed development or subdivision with different considerations. His strongest concern is the regulatory requirement for either on-site or community wastewater treatment. The developer also attempts to minimize both upfront costs and ongoing maintenance responsibilities once the development is complete. It is in the developer's interest to seek options which are easily and quickly implemented, thus reducing delay.

The following institutional arrangements are available for operation and maintenance:

- establishment of a homeowners association
- designation of a third party trustee
- incorporation as a public utility
- delegation of responsibility to a private contractor
- establishment of performance bonding requirements by escrow account or other such insurance



The Wake County portion of the Falls of the Neuse Watershed appears in the hatched marks.

	Agency Concerns	Developer Concerns
HOMEOWNERS ASSOCIATION	1. assurance that Homeowner Association has adequate expertise, resource to operate complex wastewater system 2. absence of market to dispose of assets held in common by homeowner association in the event of malfunction 3. Covenants should guarantee automatic membership of individual owners in homeowner association, and guarantee the association, as well as individual owners, power of covenant enforcement*	1. simple, inexpensive transfer of treatment system when development complete(however, operating permit not transferable) 2. up-front costs if articles of incorporation require reserve account
THIRD PARTY TRUSTEE	1. agency may designate acceptable trustee 2. provides immediate recourse in event of malfunction. Cost recovery between trustee and original owner	1. once trustee agrees, simple and inexpensive 2. few up-front costs except when trustee requires some form of security
PUBLIC UTILITY	1. new state regulations grant local governmental units the authority to use this option 2. possible "gap" in ownership since Utility Commission will not approve until development completed. 3. permitting through state agency removes local authority and control	1. extensive legal, administrative requirements 2. reserve fund required by Utility Commission 3. staffing , administrative costs for operation
PRIVATE CONTRACTOR	1. agency still ultimately liable 2. supervision of contractor 3. availability, certification of qualified contractors	1. delay in securing, certifying contractors 2. few up-front administrative costs
BONDING, ESCROW ACCOUNT	1. assurance that agency designee will receive account in event of developer bankruptcy 2. difficulty in setting amount sufficient to make necessary repairs but not overly burdensome to developer	1. up-front cost/premium paid to insurer 2. inability to assure proper homeowner operation yet developer is still liable

*O'Mara, W. Paul. 1978. Residential Development Handbook. Washington, D.C.: ULI-The Urban Land Institute. pp. 275-281.

Choice of these arrangements depends on existing county policies and regulations (or lack of guidance in these matters). Developers will favor institutional arrangements that are expedient and uncomplicated.

An association of homeowners in a development can register as a non-profit organization in order to operate, manage, and maintain properties held in common. Open space, recreation, and wastewater treatment facilities are often held by the homeowners association.

In the third party trustee arrangement, the developer deeds over ownership of the treatment facilities in the event of a malfunction or failure. The trustee serves as a "co-signor with a deep pocket" to provide continued proper operation of the wastewater system. The county is assured of a party legally responsible for proper operation. Furthermore, this option allows the trustee, often a bank or trust company, to make necessary repairs and seek reimbursement from the original owner. In some areas (like Mecklenburg County, N.C.), the third party trustee has been a savings and loan or other financial institution.

If a public utility is created, the incorporated unit (and its assets) is listed with the Secretary of State and the North Carolina Utilities Commission. The Utilities Commission oversees rate-making and reserve account requirements. The public utility then legally assumes the functions of operation, maintenance, billing, repairs, and setting of service fees and area.

When a city or county contracts for operation and maintenance responsibilities with a private contractor, the city or county remains ultimately liable for the contractor's performance. This option has become more attractive to the public sector as more and more firms offer these services.

The final option for the developer is to provide a performance bond or escrow account on behalf of the governmental unit to ensure adequate funds for the operation and maintenance of the wastewater facility over a specified period of time. The escrow account must be sufficient to fund future repairs which may be necessary and to assure compliance in the interim. One drawback to this option is that the local government may not have access to the escrow account if the developer declares bankruptcy. An escrow account or performance bond may not be protected from other claims in the event of bankruptcy. When a performance insurance bond is set, an initial premium paid by the developer assures release of the amount to the designated party in the event of a treatment facility malfunction.

Changing State Regulations

The 1983 session of the North Carolina General Assembly substantially rewrote public health laws contained in Chapter 130A of the General Statutes. Three major changes, effective January 1, 1984, affect the local health department role concerning wastewater treatment:

1. Local health department responsibilities are expanded and clarified
2. An operating permit is required in addition to the improvements permit now issued upon inspection by the health department
3. Administrative fines and remedies are set

To understand responsibilities of the local health department, relationships between state agencies must first be sorted out.

The new regulations assign regulatory authority for all treatment systems which discharge to the land surface or water to the Division of Environmental Management within the Department of Natural Resources and Community Development. Examples of systems under this authority include spray irrigation, overland flow, land application, and small discharging systems (so called "package plants"). All publicly owned systems, including those operated as pubic utilities, also fall under jurisdiction of the Division of Environmental Management regardless of the type of treatment.

Rules adopted by the Commission for Health Services in the Department of Human Resources govern any treatment system which discharges below the ground, including conventional or alternative septic systems.

The new rules also extend additional authority to local health departments. Local rules may be more stringent than applicable state regulations where necessary.

One of the many new subdivision homes in the Falls Lake Watershed.

Upon determining that the ground absorption system is properly installed and appears to meet the condition of the improvements permit, the local health department may issue an operation permit. This additional oversight now allows local health departments to monitor the ongoing operation of the system. This operations permit can be legally conditioned on operation and maintenance requirements of the site. The local permitting agency can invoke legal remedies if the conditions of the operations permit are violated.

The Dam at Falls of the Neuse Reservoir.

New Penalties

Administrative penalties which give greater strength and immediacy to health department actions in the case of malfunctioning wastewater systems are spelled out in the new laws. If the local agency determines a public health nuisance exists, an order of abatement may be issued. If the conditions stated are not remedied, local authorities may intercede to make necessary repairs. Expenses can be recovered through a high priority lien against the property. In the case of bankruptcy, this lien is payable immediately after tax debt.

More serious problems are addressed through the imminent hazard clause. Certain actions may be taken if a situation is likely to cause an immediate threat to life or serious risk of irreparable damage to the environment: fines of up to $50 per day for an individual system or $300 per day for a community system may be imposed by the local health department.

Wake County Example

Recently Wake County has adopted local regulations that exceed state requirements. Wake County is the site of the new 12,500 acre Falls of the Neuse Reservoir, a Corps of Engineers project expected to yield up to 10 million gallons per day as water supply to the city of Raleigh and surrounding jurisdictions.

Responding to increased residential development activity in the Falls watershed, the Wake County Board of Health adopted more stringent standards for surface-discharge treatment plants. The rules and regulations were adopted in September 1983, effective October 1, 1983. The Wake County considerations were developed concurrent with revisions to the state health laws. Actions by the Wake County Board of Health were initiated when evidence suggested that manpower and oversight responsibilities by the N.C. Department of Natural Resources and Community Development did not provide sufficient protection to the drinking water supply of the Falls of the Neuse impoundment.

The Board of Health set effluent standards that specified a phosphorus limit of one part per million. In addition to a valid permit from the N.C. Division of Environmental Management, a package treatment plant operating in Wake County's portion of the watershed must secure an operating permit from the county health department. The operating permit also specifies design standards, operator certification, and a 24-hour capacity for emergency storage of untreated wastewater. Duration of the permit runs concurrent with the Division of Environmental Management permit and is renewable every five years. Existing plants in the water supply watershed must also meet the same requirements. When publicly-owned sewer lines become available, use of package plants must be discontinued, except in certain circumstances.

Conclusions

Public health and other officials are just beginning to examine local management options for private wastewater systems. Conflicts between developer concerns for expediency and governmental assurances of adequate performance over time have yet to sort themselves out.

The following agencies and individuals have developed some expertise in this issue and can serve as resources to jurisdictions facing similar problems:

Edward Holland, Director of Natural Resource Programs
Triangle J Council of Governments
P.O. Box 12276
Research Triangle Park, NC 27709
(919) 549-0551

Wake County Board of Health
Wake County Courthouse
Raleigh, NC
(919) 755-6107

Ed Holland, of Triangle J Council of Governments, contributed to the development of ideas contained in this article.

PERFORMANCE, continued from page 21

a possible 200 points were determined to be the level that provides the minimum acceptable stormwater management. The performance zone requirement applies to all subdivision, business and office development proposed for the part of the watershed in the jurisdiction of High Point and to all single lot development within 2,000 feet of the two lakes and Deep River which connects the lakes.

The performance zone and rating system were chosen over other land use strategies including large lot zoning, low density zoning, and planned unit development districts for several reasons. First, the rating system directly assesses the impact of the stormwater on the quality of the water supply. Second, it gives a developer flexibility in designing a project since if a proposal rates poorly on one factor, it can atone for it by scoring higher on another factor. Third, it does not arbitrarily treat each case the same such as with a blanket density restriction, but instead treats each situation based on its unique set of circumstances.

DEVELOPERS AND LOCAL OFFICIALS HAVE OVERWHELMINGLY PREFERRED THE RATING SYSTEM TO A DENSITY LIMITATION

Fourth, since the rating system requirement is in addition to the zoning regulations, it does not mix environmental concerns with rezoning issues involving the appropriate land use, density and building style. These advantages are the reason developers and local officials have overwhelmingly preferred the rating system to a density limitation or other inflexible zoning regulation. For example, after studying other solutions, Guilford County (in which most of High Point and its water supply watersheds are located) is seriously considering adoption of an adapted version of the rating system for the water supply watersheds that comprise over half of its jurisdiction.

Conclusion

Recognizing the importance of a good water supply, High Point adopted a watershed performance zone with a rating system to protect its two water supply lakes. Although the rating system is not based on scientifically proven relationships between types of development and water quality, it is an attempt to make the best judgement based on the most complete and reliable knowledge available at the present. When weighed against the alternative of taking no action until the exact effects of development on the quality of water supplies can be accurately predicted, the rating system is a useful tool to protect water supply resources before they become deteriorated or perhaps unusable.

Jackie Dingfelder

An Electric Southeast

Implications for Water Resource Planning

Growth in population, production, and income in the Southeastern U.S. is directly translated into growth in energy consumption. As a result, the environmental effects of fuel extraction, its conversion into other forms of energy, and the distribution and utilization of those forms has increased. Among the many dimensions of energy environmental linkages in the Southeast that must be explored is the relationship between electrical power production and the quantity and quality of the water resources. Presented here are two aspects of water use and energy. One is an overall view of energy consumption and the implications for water resource planning in the Southeast. The other specifically addresses the potential for the increased use of hydroelectric power at a small scale in North Carolina. Both present relevant information for the water resource planner.

Excerpts from "Electricity, Air Quality, and Water Resources in the Southeast", updated from a 1978 paper by David H. Moreau.

The majority of the existing power plants in the Southeast have nuclear or fossil fuel sources (see Table 1). Water consumption rates are extremely large for nuclear and fossil fuel plants. Consequently, the greatest amount of water resources will be utilized by the aforementioned energy sources.

Water resource implications of electricity generation are of several dimensions, including: (1) the use of water for dissipating large quantities of heat, (2) contamination by chemicals

WE MUST EXPLORE THE RELATIONSHIP BETWEEN POWER PRODUCTION AND THE QUANTITY/QUALITY OF WATER

contained in steam condensate and other waters from periodic cleaning of boilers and flue-gas scrubbers, and (3) water requirements for operation of flue-gas scrubbers and water pollution resulting from those units. All of these effects are important but the most significant and the one of primary concern is the evaporative loss of water from wet cooling towers.

While there is some variability in those losses from one cooling technology to another and from one place to another in the Southeast, most of the estimated losses for the region fall within a range of 9 to 12 cubic feet of

Table 1
EXISTING INVENTORY OF ELECTRICAL GENERATING CAPACITY IN THE SOUTHEAST

Energy Source	Nameplate Capacity, MW	Percent of Total
Hydro	13,217	9
Nuclear	19,023	14
Coal	71,804	52
Natural Gas	6,783	5
Oil	27,405	20
TOTAL	138,432	100

SOURCE: Inventory of Power Plants in the United States, Department of Energy, December 1982.

water per million BTU. With these evaporative loss rates, heat rejection rates of 5000 BTU/per kilowatt hour (kwhr) for fossil fuel plants and 7250 BTU/kwhr for nuclear plants, and with an annual capacity factor of 75 percent, plants with a rated output of 1000MW would have consumptive uses as follows:

Table 2
CONSUMPTIVE WATER USE IN COOLING

Type of Plant	Consumptive Use for Cooling, MGD
fossil fuel	6 - 8
nuclear	9 - 12

At an annual demand of 10,000 kwhr/person in the Southeast and the above heat rejection

Jackie Dingfelder is a Master's candidate in the Department of City and Regional Planning at the University of North Carolina-Chapel Hill.

and evaporative loss rates, the consumptive use of water per capita for electricity generation is in the range of 9.2-12.3 gallons per capita per day (gpcd) for fossil fuel plants and 13.3-17.8 gpcd for nuclear plants.

To put these quantities of water consumption into another perspective, consider that cities in the Southeast with moderate levels of water-intensive industries withdraw water at a rate of 150 gpcd. Since approximately 80 percent of that water is returned to streams, the consumptive use is approximately 30 gpcd. Thus, a consumptive use of one million gallons per day (1 MGD) for power plants is equivalent to the consumptive use of an urban population of 33,300 persons, and it is equivalent to the withdrawal rate of an urban population of approximately 6700 persons.

Table 3
EQUIVALENT URBAN POPULATION IN THOUSANDS CORRESPONDING TO FOSSIL FUEL AND NUCLEAR PLANT WATER DEMANDS

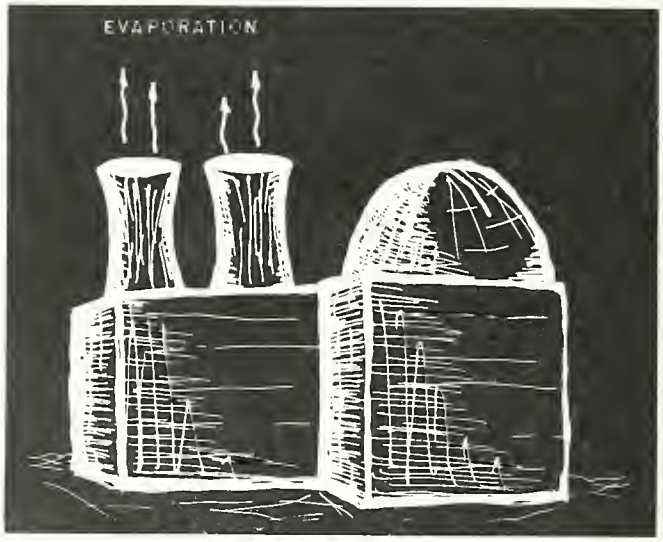
Type of Plant	Consumptive Use	Withdrawal Rates
1000MW fossil fuel	200-267	40-53
1000MW nuclear	300-400	60-80

With the projected addition of nearly 42,000MW capacity (42 percent nuclear and 48 percent fossil) over the next decade (DOE, 1982), the evaporative losses from power plants in the Southeast are equivalent to satisfying the consumptive losses of an urban population increase of 10-13 million persons. Those losses are equivalent to the withdrawal rates of an urban population of 2-2.5 million. These increases must be superimposed on increasing demands from other sectors of the region's economy.

Although the Southeast has an abundant supply of water relative to other regions of the U.S., the location of that supply relative to urban and power plant demands and the rapidly growing magnitude of those demands will soon dictate the use of water planning and management techniques that are much more complex than those in use today.

THIS ERA OF MEETING NEEDS FROM ABUNDANT LOCAL SOURCES IS DRAWING TO A CLOSE IN MANY PARTS OF THE REGION

There are 65 Standard Metropolitan Statistical Areas (SMSAs) in the Southeast; 13 are in Florida, but of the remaining 52, only eight are located on coastlines. Local imbalances between supply and demand are emerging in the vicinity of those metropolitan areas along the Washington-Atlanta-Birmingham corridor because most of the SMSA's along that route are located near the headwaters of streams which that route intersects. Within those areas there are emerging strongly competitive demands for high quality public water supplies, specifically for recreational uses, hydroelectric power, cooling water for fossil and nuclear powered electricity, and for maintenance of ample in-stream flows to protect water quality.



In the past, water demands have been satisfied by locally available resources with little concern for the quantity of water used. This era of meeting needs from abundant local sources, however, is drawing to a close in many parts of the region. This is evidenced by public concerns over proposed interbasin transfers to provide future water supplies for Atlanta, Greensboro, and Norfolk.

Implications for Water Resources Planning

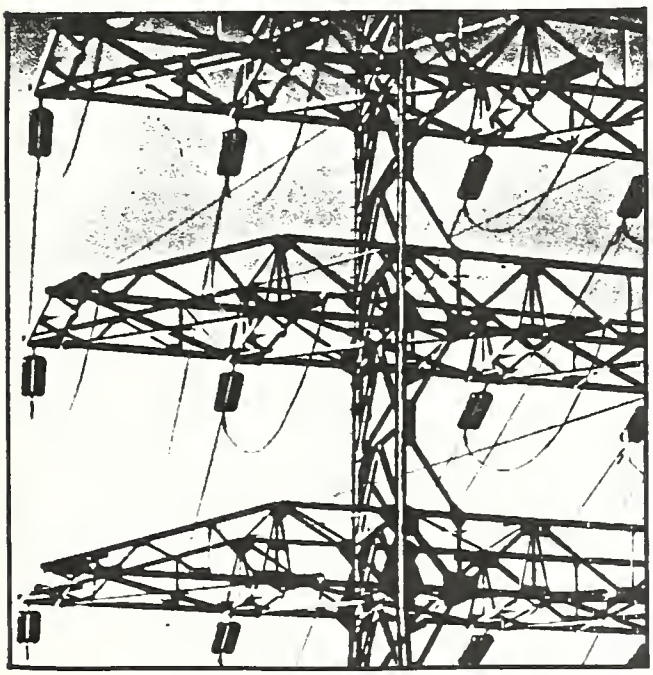
Water resource planning in the Southeast today reflects the relative simplicity with which the resource has been managed in the past. It is highly decentralized; with electric utilities, municipalities, and state and Federal agencies having separate jurisdiction over water quality protection, river basin development, and small watershed management. As competition among water users for a diverse set of uses continues to increase, and as the interdependencies among those users become more intensive, the decentralized planning and management processes must also be modified. Such arguments are well-known and have led to the formulation of guidelines for comprehensive water resource planning.

The impact of electrical energy generation on water resources is growing at such a rate that the decentralized process by which electric utilities and other users of water independently plan for their needs is no longer adequate if

either energy or water resources are to be used most beneficially. Consider the case of multiple purpose energy systems in comparison with single purpose electricity generating systems which presently prevail in the Southeast. Multiple purpose energy systems include a variety of technologies such as utilization of waste heat from existing power plants, industrial cogeneration of process steam and electricity with or without the sale of excess electricity to utilities, and district heating-electricity generation for institutional, commercial, or residential complexes.

Such schemes can result in overall energy efficiencies of up to 75 percent in selected applications, a substantial improvement over present limits of approximately 40 percent in single purpose power plant. Cooling systems can be entirely eliminated from such systems, and as a corollary to improved energy efficiency, pollution from fossil fuel combustion is reduced.

The water resource will be significantly impacted by 1990 when the consumption loss from evaporative cooling of new plants is projected to fall in the range of 700 to 1000 MGD by 1990. While this demand, associated with plants that have already been sited, can be met, it hastens the day for more careful development and allocation of water resources in the region. Competitive demands for cooling water, public water supplies, recreational demands, in-stream uses, and other uses of inland streams are growing at a rate that will soon exhaust locally available resources. Because of these impacts there is a need for more centralized planning for water resources with increased attention to the role of cooling water for electric power production. This would meet the dual objective of expanding availability of water and increasing the efficiency with which both water and fuels are used.



In his paper, Moreau reviews a few of the impacts of electric power generation on water resources and he presents evidence supporting a stronger attention to existing and alternative energy technologies in water resource planning. Hydroelectric power, accounting for nine percent of the existing Southeastern power plants in 1982, is a viable energy alternative not discussed in Moreau's paper.

Harvard Ayers has recently published a paper that specifically addresses the use of hydroelectric power as a small scale alternative for power generation in North Carolina.

Excerpts from "The Potential for Small and Micro-Hydro Electric Power in North Carolina" by Harvard G. Ayers (1983, Carolina Environmental Affairs Conference)

North Carolina currently has about 250 moderate to large dams on its streams. In 1980, the Piedmont Crescent Energy Project under the direction of Thom Gunter carried out a contract for the North Carolina Department of Commerce, Energy Division intended to provide an inventory of existing small-scale hydropower sites in the state. Sources such as the N.C. Dam Safety files and the U.S. Army Corps of Engineers as well as individual site owners were consulted, resulting in a list of 222 dams resulted.

In 1981, the N.C. Energy Division contracted with Appalachian State University (ASU) to encourage further development of hydropower in the state. Project activities included encouraging commercialization of feasible sites by offering financial and technical assistance, and site visits to 102 of the dams.

Summary of Dam Inventory

A grand total of 246 dams were studied by the ASU contract. Below is a list of the numbers of dams for each status:

Table 1
NUMBER OF DAMS BY STATUS CATEGORY

Category	Number of Dams
A Presently Producing Power	45
B Formerly Produced Power	64
C Never Produced Power	94
D Breached or Destroyed	22
E Status Not Available	19
F Under Construction	2
	246

The study covered a 24 county, 10,000 square mile area that included essentially all of the significant topographic relief in the state. Elevations of this area ranged from 2000 feet to over 6000 feet above mean sea level. Some counties had vast elevation differences and others very little.

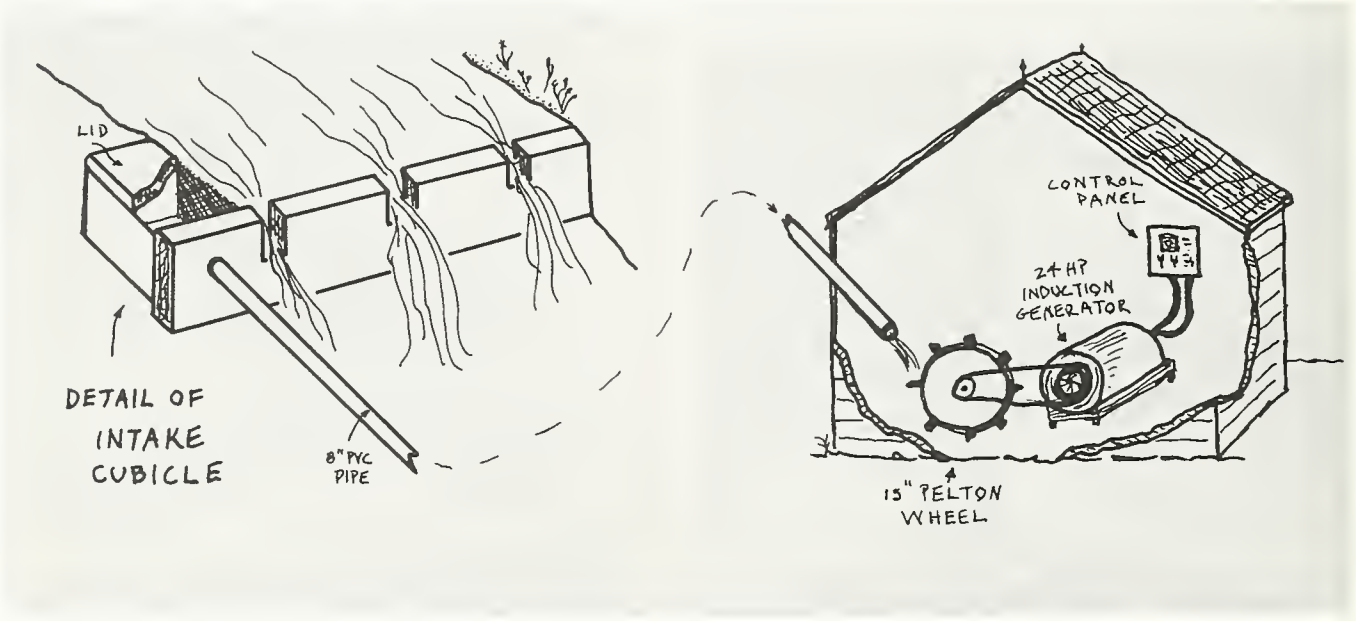
A great variety of stream flows per unit area was also found. High flows were fairly well correlated with high elevations, a phenomenon well-known to hydrologists. Variation of as much as three to four times was found with lower flows generally being reported in the northeastern part of the study area and higher flows in the southwest. Because the greater topographic relief as well as the greater stream flows are found in the southwest mountains, that area has by far the heaviest concentration of sites with good power potential.

The 10,000 square mile study area is dissected by about 7,500 miles of major streams. A methodology was developed for determining the micro-hydro production potential of all streams within the area. The methodology was designed to enable consistent, site specific estimates to be made of the maximum feasible production potential throughout the study region, based upon the best available hydrologic and topographic data.

Results of Assessment Study

Based on the methodology described in the study, 1,592 feasible sites (5-200 KW) were identified for the 24 counties in the study area. The average annual production potential of these sites is 28,075 kilowatts. Another thirteen sites with potentials of over 200 KW had 7,147 KW potential. This works out to an average production of about 308,000,000 KWH assuming no mechanical or other system malfunctions. Allowing for some downtime, about 250,000,000 KWH might be expected if all these sites were developed.

The micro-hydro sites were not evenly distributed throughout the study area. Five counties in the southwestern part of the study area accounted for about 56% of the potential sites for the 24 county area. One county, Rutherford, had only one feasible site. Table 2 lists numbers of sites and average KW potential for the 24 counties.



Micro-hydro demonstration schematic, including plan view of intake structure.

Table 2
NUMBER OF FEASIBLE SITES AND AVERAGE PRODUCTION CAPACITY BY COUNTY

County	Sites	Average KW
Alleghany	5	44.7
Ashe	3	124.4
Avery	36	606.6
Buncombe	80	1226.0
Burke	12	280.1
Caldwell	17	352.3
Cherokee	95	1224.0
Cherokee Reservation	53	970.0
Clay	107	1335.0
Graham	156	3063.0
Haywood	216	3694.0
Henderson	42	594.0
Jackson	202	4914.0
Macon	193	4871.0
McDowell	18	288.0
Madison	52	581.0
Mitchell	14	324.6
Polk	22	1347.0
Rutherford	1	74.6
Transylvania	141	6763.0
Surry	4	79.2
Swain	65	1098.0

Environmental Concerns

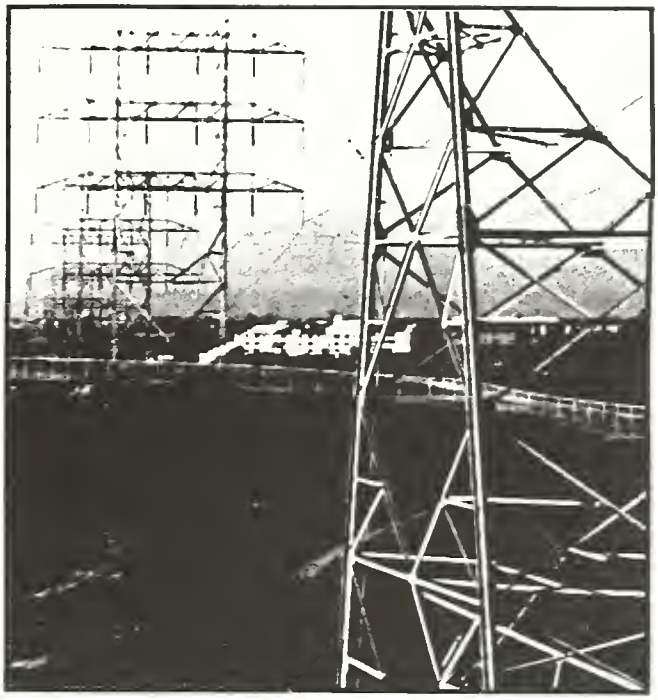
The subject of the environmental effects of both small and micro-hydro power were given separate billing because of the importance assigned to environmental protection by those involved with the projects. Hydro projects at existing dams and at sites which can develop significant head from the natural stream gradient can be developed with a minimum of environmental degradation. Micro-hydro power projects cause significantly less environmental damage than do conventional power sources such as fossil fuels and nuclear power.

For existing dams, assuming that the environmental damage caused by impoundment has already occurred, the largest single environmental problem is that of reducing natural stream flows to facilitate power production. With dams which use their reservoir to store water for peak demand production, this problem is especially

MICRO-HYDRO POWER PROJECTS CAUSE SIGNIFICANTLY LESS DAMAGE.....

acute. While water is being stored, the stream is deprived of normal flow. Such deprivation is obviously most damaging immediately below the dam where lower tributaries have not had a chance to add to the flow.

For natural gradient, or pipe-the-pressure systems, the water needed to produce power is kept from the stream only over the pipeline distance. While fish migration is usually not a significant factor on streams steep enough to be feasible for pipe-the-pressure systems, care must still be taken to protect aquatic life over the often lengthy pipelines.



Conclusions

Moreau presents some important points with regard to water resource planning for the Southeast. As growth in the Southeast continues at a high rate, there also exists an increased demand for energy production. Consequently, more water will be consumed by power plants using evaporative cooling techniques in energy production. Competition for water will increase, thus centralized planning can play a key role in the proper allocation of existing water resources.

In contrast to Moreau's paper, the study presented by Ayers indicates that many counties in North Carolina have a high potential for micro-hydro power generation. The environmental impacts from micro-hydro power are much less than the impacts from conventional power plants. Unfortunately, the potential micro-hydro sites are fairly decentralized and only can be viable as a supplement to the larger power plants. With increasing demands, hydro power can possibly fill the gap in need for additional energy, but with reduced impacts on the environment.

David H. Moreau is a professor in the Department of City and Regional Planning at the University of North Carolina-Chapel Hill, and Harvard G. Ayers is a professor in the Department of Anthropology at Appalachian State University.

North Carolina's Stream Watch Program
Citizen Involvement in Water Protection

North Carolina's Department of Natural Resources and Community Development (NRCD), under the leadership of Secretary Joe Grimsley, has placed a high priority on increasing citizen involvement in the department's programs. The Stream Watch program, launched in March 1983, was developed to encourage citizens to become actively involved in local water resource management and protection. The program's three primary goals are:

1. To encourage North Carolina's citizens to "adopt" watersheds near their homes and make a long-range commitment to watch over and care for those areas
2. To increase citizens' awareness of and involvement in water resource management and protection
3. To establish a working partnership among North Carolina's citizens, industries and state and local governments

Citizen groups interested in participating in Stream Watch are asked to identify a local creek, river, lake or estuary that they are particularly concerned about. They agree to adopt that area, and register it with the central Stream Watch Coordinator in Raleigh. In return, they receive a folder of information on the Stream Watch program and related water resource issues. The groups are asked to inventory their adopted areas, learning about their history, land uses and natural assets. They should evaluate the areas' potentials and take stock of their present needs and problems.

The seven NRCD regional offices provide staff support for Stream Watch activities, but groups must take the initiative for planning appropriate projects. Financial support has been made available through a $30,000 grant from the Z. Smith Reynolds Foundation. This money has been allocated to many groups throughout the state in the form of grants ranging from $200 to $1000.

Stream Watch Groups Adopt Entire Watersheds

Stream Watch groups are encouraged to adopt not only a creek or lake but also the tributaries and surrounding land areas that drain into their adopted water body. By learning about the entire watershed, groups learn to ignore political boundaries and appreciate the complexities and interrelationships of an aquatic system. They can plan activities and set goals and objectives for an entire watershed, knowing that land and water uses in headwater areas affect the water body along its entire length. The central coordinator will keep Stream Watch groups informed about other groups in the river basin containing their adopted watersheds. These groups can then work together on issues pertinent to the entire area.

MORE THAN 2000 MILES OF MARYLAND STREAMS ARE CARED FOR BY PARTICIPANTS IN THAT PROGRAM

A Stream Watch group should stay informed about local, state, and federal plans that could affect its watershed. It should monitor planned development in its area and watch for adverse effects on streams and tributaries of its water body.

Public education is the key to informed decision-making. Stream Watch groups should learn as much as they can about technical, legal, and political water issues, then spread their knowledge to the surrounding community. If they nurture a positive public image, Stream Watch groups can become the local focal point for citizen participation in water resource issues.

Margaret Kerr is Stream Watch Coordinator with the Division of Environmental Management, N.C. Department of Natural Resources and Community Development.

How Successful is Stream Watch?

Announced in March of 1983, Stream Watch is less than a year old. More than fifty groups are already participating in the program, providing interest and protection for many miles of the state's streams, lakes and rivers. The participating groups constitute a diverse collection, including schools, community clubs, fishermen's clubs, Sierra and Audubon clubs, previously existing river basin associations and newly formed citizens groups. Groups exist in fourteen of the state's seventeen major river basins. No groups have adopted creeks in the Broad, Catawba or Savannah river basins at this time.

The majority of these groups has received some funding from the Z. Smith Reynolds foundation grant. Projects are underway to clean and restore creeks, monitor water quality, publish newsletters and educational materials, and develop slide shows. Several groups have already become strong, viable forces in their communities and are beginning to have an impact on decisions that affect their adopted areas.

Is Stream Watch a New Idea?

The concept of a network of volunteer river basin groups organized by a central coordinator is not unique to North Carolina. More than thirteen years ago, a national conservation organization, the Izaac Walton League, started a "Save Our Streams" program. It encouraged its chapters throughout the country to adopt a river and work to improve and protect it. The program was coordinated by the Izaac Walton League's central office, and continues today.

In 1970, the State of Maryland incorporated the Izaac Walton League's program into its state government. The rapid suburbanization of many areas in Maryland was producing tremendous siltation and other water quality problems in the state's creeks and streams. Public education was seen as the key to controlling this nonpoint source pollution. A central "Save Our Streams" coordinator was hired and active grassroots organizing was begun. The program emphasized urban housekeeping by teaching people how their activities affected water quality of the streams near their homes. The program has been widely accepted. According to an October 1981 publication, "Accomplishments of Save Our Streams", more than 2000 miles of Maryland streams are cared for by participants in the program. The program has organized more than sixty one-day stream studies and trained more than one thousand citizens to collect chemical and biological water quality data. The state has used studies performed by "Save Our Streams" volunteers to pinpoint water quality problems.

In Bellevue, Washington, concern over declining salmon populations in local streams provided the impetus for a citizen action program. Federal funds supported a four-year demonstration Salmon Enhancement program. Citizen groups adopted streams that were in need of restoration. They developed long-range restoration plans and applied for grants to fund their projects. Volunteers cleared streams of debris, constructed fish ladders, and raised and released salmon fingerlings to their restored creeks. The program heightened citizen awareness of the area's water quality needs and created an active constituency supporting the city's environmental programs.

Where Will Stream Watch Go From Here?

Stream Watch is still in its infant stages. groups throughout the state are working on a wide spectrum of exciting and challenging projects. In the future, it would also be possible to use the Stream Watch network to promote specific stream programs. The following list includes just a few of the water resource issues that could be emphasized by Stream Watch.

Public School Water Resource Education. Many of the materials prepared for Stream Watch could be adapted for classroom curriculums. Students at many grade levels would benefit from learning about aquatic habitats, water and wastewater management, water cycles in nature, and land uses affecting water quality. High school science clubs could participate by developing and executing water quality studies. Since public education is one of the program's primary goals, an effort should be made to reach the state's public school systems.

Control of Urban Runoff. Runoff from urban areas carries sediment, heavy metals, oils and numerous other pollutants to our streams, creeks and lakes. The control of this pollution is expensive and difficult to implement. Individual homeowners and small businessmen could do a great deal to minimize the runoff pollution from their properties. Stream Watch could be used to launch a statewide campaign to educate citizens about this problem.

Water Conservation Education. North Carolina is blessed by a rich and plentiful supply of water. However, demands on this supply increase daily and measures should be taken to educate citizens about water conservation. Gerald Meral, Deputy Director of California's Department of Water Resources, describes in "California's Lead in Promoting Water Conservation" (1982) how California used a residential bathroom retrofit project to both increase citizen awareness of water conservation and implement conservation measures. Water conservation kits containing toilet dams and shower restrictors were distributed in southern California neighborhoods. He estimated that over a million toilets were retrofitted and 560,000 showers were adapted. The water savings were estimated to be 24,000 acre-feet of water per year. A similar project could be planned and executed through the Stream Watch network.

Summary and Conclusions

The Stream Watch concept has been rapidly accepted by the citizens of North Carolina. The ideal of resource management through education, participation and cooperation appeals to a broad range of interest groups. The Stream Watch program can build a powerful constituency supporting North Carolina's water resource programs.

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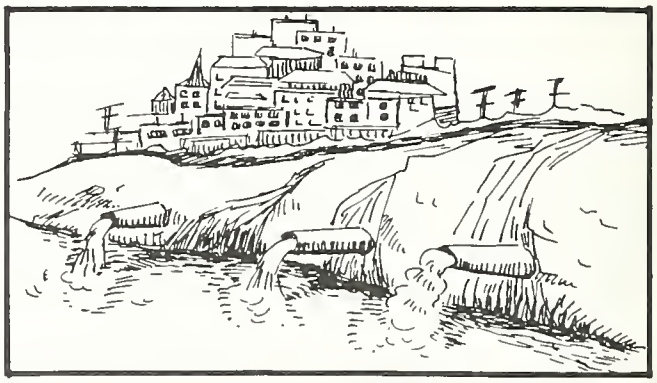
In August of 1983, Governor Bob Graham announced Florida's "Save Our Everglades" program, stating that this natural system should function the same way in the year 2000 as it did in 1900. One component of the program is to remove water control structures and return sheet flow to the Everglades. The South Florida Management District is also considering restoring the channelized Kissimee River to improve water quality. To the north, the Saint John's Water Management District is spending $12 million to purchase flood-prone land to avoid constructing flood control structures.



Aggressive action is needed if North Carolina is to avoid the same water resource crises now experienced by Florida and other more populated states. The first step would be for state government to adopt an attitude more farsighted and more selective as to the types of growth recruited and permitted.

The state must identify existing and imminent water resource problems. Critical watersheds and groundwater systems must be identified and protected. And, regulatory and assistance programs have to be instituted to include unregulated land disturbing activities.

"We've reached the point in North Carolina where we can't let everyone do what he or she pleases with our resources," Henri Johnson, attorney for the North Carolina Fisheries Association, said in a recent television interview about the peat mining project. She believes that hard decisions have to be made about how much impact from new growth is acceptable while still protecting water resources.

"With the conversion of freshwater wetlands," Johnson said in a later interview, "we have 24,000 people who depend upon commercial fishing that may lose their way of life. But what is really disturbing is that the same decision-making process that got us in this mess on the coast also applies statewide. People inland are going to have a lot more to worry about than the plight of our coastal fisheries if runoff and chemical pollution is not adequately regulated -- and sometime soon."

Book Reviews

THE AMERICAN PLANNER: BIOGRAPHIES AND RECOLLECTIONS ● SALES TAXATION: STATE AND LOCAL STRUCTURE AND ADMINISTRATION

John Mikesell and John Fitzgerald
Baltimore: Johns Hopkins University Press, 1983

SALES TAXATION: STATE AND LOCAL STRUCTURE AND ADMINISTRATION

Carol Shaw

During the 1983 Legislative session, the North Carolina General Assembly passed an additional one-half cent local sales tax for all the counties in the state. The majority of the expected revenue from the sales tax is earmarked for the capital costs of education and water facilities. The General Assembly's authorization of this new tax highlights the increasing importance of sales tax revenue in state and local government budgets.

Since the sales tax revenue is becoming more necessary to local governments, planners and government officials need to be better informed about the effect and uses of sales taxes. John F. Due and John L. Mikesell's new book, Sales Taxation: State and Local Structure and Administration, is an excellent source of information because it is a detailed survey and analysis of the structure and operation of state and local sales taxes. The book contains details about all aspects of state and local sales taxes including sales tax structure and rates, exemptions, and administration. An entire chapter is devoted to local government sales taxes which explains the general purpose and structure of this type of sales tax. The most important element of Sales Taxation is the comparison of states and their use of both local and state sales taxes. For example, North Carolina's state tax rate of three percent is one of the lowest in the nation, while Connecticut has the highest at seven and one-half percent.

Sales Taxation is not intended to provide an economic analysis of sales taxation or to discuss the appropriate role of sales taxes in state/local tax structures. These issues are dealt with in other sources. But the survey approach in Sales Taxation makes the book a fine reference for planners and administrators who want to learn more about the subject.

Donald Krueckeberg
New York: Methuen, 1983

THE AMERICAN PLANNER: BIOGRAPHIES AND RECOLLECTIONS

Scott Bollens

In his introduction to this historical compilation, Kreuckeberg states that his book is not a sentimental regret about a lost world, but rather an opportunity for planners to review their commitments, and extend their sense of company. The old adage about "learning from the past" is resurrected, as often is the case in planning history books. The view here is that within current decreased planning activity there is a search for new direction, and that this search for how and why planners proceed is more important than where they go from here. Today's planners, so often lost in day-to-day responsibilities, can benefit by turning to history because it reminds them that the past was often very different from today: not routine. Although Kreuckeberg is guilty of glorifying the achievements of the past and downgrading the current ability of planners to affect contemporary society, this descriptive journey through the lives of famous planners is a valuable contribution to a profession which has searched endlessly for its identity.

After the introductory section, each of the chapters describes the life and recollections of a particular American planner. The biographies cover a time span from roughly 1885 to the present, and the seventeen biographies are broken up into three groups which represent the three general phases of planning: the planners, the regionalists, and the professionals. This book is comparable to Mel Scott's American City Planning Since 1890 in its breadth of coverage. However, whereas Scott emphasized historical trends and placed biographical content in a secondary position, The American Planner views the profession as one driven by individuals. The book uses biography as its guide through planning trends of the last century.

The 1890s and 1980s represent two extremes: the private, entrepreneurial, atomistic, physi-

cal planning of the turn of the century; and today's dominance of public deliberation and government regulation. The "City Beautiful" movement at the end of the 19th century gave way to the "City Practical" era of the early 1900s, pushed along by the Progressive Reform movement. From the 1920s to the New Deal era, the idea of regionalism arose, with two divergent camps -- metropolitan growth facilitation (Charles Dyer Norton and "The Regional Plan of New York and its Environs") vs. decentralization (represented best by Lewis Mumford).

Between the World Wars, the National Resources Planning Board (NRPB and its alphabetic variants) put planning on the national level at the same time that city planning agencies were atrophying. Another direction of planning incubated at this time, which lasted through the Second World War and into the present: the professionalization of the planner. This phase is characterized by the view of planning as a primary career, and the planner's comprehensive involvement in the field's development.

Krueckeberg suggests that contemporary planning has possibly completed a cycle, with the eclecticism and pluralism of today's planners diluting the definition of planning. This is reminiscent of the days of the planning pioneers at the turn of the century, when the planning process involved a mix of many disciplines. The desirability of this cycle closure is left to the reader's interpretation, but the current pluralism leaves the planner open to criticism of "rampant schizophrenia."

The first section of the book deals with the pioneers of the field who were first active during the Progressive Era. They include: John Nolen, landscape architect; Benjamin Marsh, political organizer; Walter Moody, promoter and professional booster; Edward Bassett, the "father of American zoning;" Alfred Bettman, lawyer and civic reform leader; and Edith Elmer Wood and Catherine Bauer, housing reformers.

Krueckeberg then examines the regionalists, who arose in the 1920s and expanded their interests throughout the New Deal period. These individuals were synthesizers who integrated interests in regional planning, the natural environment, and new towns. They include: Charles Dyer Norton, civic leader; Benton MacKaye, naturalist; Henry Wright, architect/landscape architect; Rexford Tugwell, agricultural economist; and Lewis Mumford, writer and social critic.

The final section discusses the professionals who spanned the interests of reformers and regionalists, and established the new profession of planning as their primary career. They include: Harland Bartholomew and Ladislas Segoe, founders of major planning firms; Coleman Woodbury, economist; Charles Eliot 2nd, landscape architect and executive director of NRPB; and Charles Abrams, lawyer and housing reformer. A final chapter deals with women in planning, 1890-1980.

By relying on biographical discussion, the book tends to leave small gaps in historical coverage. However, this is balanced by thorough, life-to-death accounts of individuals who left their mark in planning annals. Also impressive are the extensive listings of references for those interested in further pursuits of information, and the book's ratio of approximately three historical quotes per page.

From the statement that a planner "must be patient without being supine" in the planner's creed, to the comment in a speech delivered by a Women's Caucus member at a 1970 ASPO meeting that "we deplore the planning that is done by men;" The American Planner provides the reader with many interesting episodes and the opportunity to live among the outstanding planners in history.

Carol Shaw is Fiscal Research Assistant for the North Carolina General Assembly, and Scott Bollens is a PhD candidate in the Department of City and Regional Planning at the University of North Carolina-Chapel Hill.

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